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D2.4.1 Recommendations for the implementation

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SEVENTH FRAMEWORK PROGRAMME

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LIST OF ABBREVIATIONS

ABBREVIATION	DESCRIPTION
3G	3rd Generation (of system for mobile communication)
AAC	Advanced Cruise Control
ADAS	Advanced Driver Assistance Systems
CAS	Collision Avoidance System
DoW	Description of Work
DFOT	Detailed FOT
GDS	Green Driving Support
GPS	Global Positioning System
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communication
FCW	Forward Collision Warning
FOT	Field Operational Test
LFOT	Large Scale FOT
LKA	Lane Keeping Assist
LKW	Lane Keeping Warning
NSD	Navigation Support (dynamic)
NSS	Navigation support (static)
PI	Performance Indicator
SA	Speed Alert
SLI	Speed Limit Information
SP	Sub Project
T	Task
TI	Traffic Information
IR	Internal Report
WP	Work Package

REVISION CHART AND HISTORY LOG

REV	DATE	AUTHOR(S)	REASON
0.1	11-06-02	S. Franzén,	First synopsis based on the FESTA FOTIP structure
0.2	11-06-20	Stig Franzén ETRA CRF	A compilation of inputs from T2.4.1 and T2.4 2 is introduced
0.3	11-07-27	Stig Franzén Alma Solar	First draft
0.5	11-11-30	Stig Franzen Alma Solar	Investigation of the possibility to get more input from test site managers – result of enquiry negative
1.0	12-04-30	Stig Franzén	Response to peer review comments used for amendment of text, etc.
1.1	12-05-12	Stig Franzén	Amended draft issued for final comments
1.2	12-12-11	Stig Franzén	Final draft – final comments addressed
2.0	13-02-22	Stig Franzén	Final version – reviewers comments taken on board

EXECUTIVE SUMMARY

The main objective of the Work Package *WP 2.4 Implementation issues* was originally the study of the possible challenges or restrictions that could arise when trying to implement the new functionalities defined within TeleFOT project. However, due to circumstances out of control for the TeleFOT consortium the work could not be performed according to the original plan.

However, the two tools introduced (VALERO and MANTIS) was instead used to capture bottom-up experiences when planning and executing the TeleFOT FOTs. The data collected is not complete but is large enough to allow for a list of recommendations to be followed when implementing new functionalities in the nomadic devices. The compilation was made according to the FESTA FOTIP Checklist and it resulted in reality in a practical test of of this Checklist.

Some issues can be highlighted such as in the area of ethical and legal issues where an emphasis must be made on signing a user agreement before the test starts, i.e. at the very start of the project.

Another important topic is the selection of systems and functions to be tested. As the data collection and the transfer systems very often are dependent on the functions and systems used they also have to be selected as early as possible. The availability of traffic data for the whole area of testing is crucial and must be guaranteed.

The data collection and management must be handled in a systematic way. The activities span over all phases of FOT activities. In TeleFOT this was demonstrated by the successful introduction of the Data Working Group. The whole data flow as well as the data analyses (as a first approach to the impact assessments to be performed) must be part of the pilot testing of the FOT set-up.

This bottom-up exercise is complementary to the top-down generic backbone of FOT activities (as demonstrated by the FESTA Handbook) but the specifics of every FOT have to be addressed. Examples of how that can be accomplished by means of the VOLERE and MANTIS Tools are shown in this deliverable.

1 Introduction

The main objective of the Work Package *WP 2.4 Implementation issues* was originally the study of the possible challenges or restrictions that could arise when trying to implement the new functionalities defined within TeleFOT project. This objective was to be split into three more specific objectives:

- Definition of Restrictions regarding user needs.
- Definition of Restrictions regarding the technologies to be used.
- Definition of a set of recommendations when trying to implement the new functionalities in the nomadic and aftermarket devices.

The reason for the WP2.4 was twofold. Firstly, the FESTA material should be further adapted to the "Nomadic and Aftermarket Devices" world. Secondly, we should learn from experiences in other FOT-activities around the world about new experiences of difficulties/obstacles, etc. for not getting a FOT off the ground. This knowledge was assumed to provide inputs to the second phase of testing during the TeleFOT project.

As the assumption of a second phase became obsolete, the work in WP2.4 was modified to that of collecting and compiling experiences made during the FOT implementation in TeleFOT and relate these findings to the FESTA Handbook FOTIP Checklist (Annex C).

As a first task the users' needs and requirements, together with the preconditions needed for the implementation of the new functionalities of the nomadic and aftermarket devices, was addressed. Two approaches were followed, the first being a functional approach from the point of view of the users of the aftermarket and nomadic devices and the second a societal/environmental approach. The VOLERE Tool (Annex A) was introduced and the Test Site Managers (and other interested partners) were asked to use the tool in their context. Preconditions needed for the implementation of new functionalities of nomadic and aftermarket devices was identified using both a societal/environmental as well as a functional approach. Ethical and legal issues were addressed.

As a second task the MANTIS Tool (Annex B) was introduced, and together with input provided by the WP 2.6 Technology and service observatory, this task covered the potential and the limitations, imposed by the use of the different technologies available in the market, of implementing the new functionalities in the nomadic and aftermarket devices.

Finally as a last task the results from the two previous tasks were brought together in order to compile a set of recommendations to be followed when implementing the functionalities in the nomadic and aftermarket devices. In principle, the experiences gained from all the TeleFOT implementations became the main body of the results and in reality it developed into a practical test of part of the FOTIP Checklist. The results of Task 2.4.1 and Task 2.4.2 was collected and compiled as experiences from the TeleFOT FOT implementations performed.

It should be noted that the data collected by the VOLERE Tool and the MANTIS Tool only cover the phases to the left of the vertical (blue) line in figure1 below, i.e. the data is mainly related to Set Up/Design, Preparation and some first approached to Data Collection.

	Set Up / Design		Preparation			Data Collection			Completion	
Convene teams and people										
Define aims, objectives, research questions & hypotheses										
Develop project management plan										
Implement procedures and protocols for communicating with stakeholders										
Design the study										
Identify and resolve legal and ethical issues										
Select and obtain FOT test platforms (vehicles, mobile devices, road side units, ...)										
Select and obtain systems and functions to be evaluated										
Select and obtain data collection and transfer systems										
Select and obtain support systems for FOT platforms										
Equip FOT test platforms with all systems										
Implement driver feedback and reporting systems										
Select / implement relational database for storing FOT data										
Test all systems against functional requirements and performance specifications										
Develop recruitment strategy and materials										
Develop driver training and briefing materials										
Pilot test FOT equipment, methods and procedures										
Run the FOT										
Analyse FOT data										
Write minutes and reports										
Disseminate the FOT findings										
Decommission the FOT										

Figure 1. The FOT Implementation Plan and its timeline

2 Data collection

2.1 The VOLERE Tool – original data

The following tables show the information collected by using the VOLERE Tool. A more detailed description of the VOLERE Tool is found in Annex A.

The template used for the VOLERE Tool (information on requirements, restrictions, potentials and limitations) is as follows:

ISSUE
R -- Restrictions or Requirements needed for the implementation of the new functionalities of the nomadic and aftermarket devices.

P -- Potentials obtained by the use of different technologies available in the market when implementing the new functionalities in the nomadic and aftermarket device

L -- Limitations imposed by the use of different technologies available in the market when implementing the new functionalities in the nomadic and aftermarket device

TYPE
T -- Technical
C -- Communications
L -- Legal
U -- User
O -- Other

Table 1. VOLERE Tool -Finland

TEST SITE	Finland	
LFOT	LFOT1	
ISSUE	TYPE	DESCRIPTION
R	T ,U	Wide variety of phones makes support difficult
R	T	The Function to be tested on phone may interact with other functionalities, which may cause undesired effects(e.g. SMS messages are acknowledged without user knowledge)
R	T	Service operators are not able to reproduce problems reported by the test users, due to wide variety of phones, possible phone settings or telecom service contracts

R	T	OBD-2 interface locations differs in vehicles. Information on the location can be retrieved through use of database
R	T,U	The OBD-2 interface may be located in a place where the OBD-2 module or the connection cable cannot be attached without being able to put the dashboard back in its place, which may be an issue for the user
R	U	Pressing one button at the start of each ride may be an issue for the test user
R	L	Service providers, not included in the TeleFOT consortium, may be required to make modifications to their software in order to allow the test regimes (reference period, actual test) and to store the information needed for TeleFOT. These activities should be agreed before making the contract with the service provider.
R	L	Tailoring of the services to integrate logging with the service provision may require much more time than expected
L	T	Different logging and communication strategies may severely impact the use of battery of the nomadic device
R	L	Tax issues should be taken into account for test user incentives, e.g. it may not be allowed to offer the devices for free to the test users at the end of the test period
R	U	users of reference group should have benefit from the tests
R	U	users may change phone, new phone does not necessarily support functions to be tested
R	L	a data protection regarding the use of personal data should be prepared and made available to potential test users
R	L	Data on speed limit (especially winter speed) do not change on the same moment in the function as in real life.
R	U	Recruitment may not be as effective as estimated

Table 2. VOLERE Tool – Italy (Reggio Emilia)

TEST SITE	Reggio Emilia	
LFOT	LFOT	
ISSUE	**TYPE**	**DESCRIPTION**
R	T	In-vehicle embedded navigators should not be used during the FOT, neither in the Test nor in the Control Group
L	U/L	User agreement needs to be signed before the test starts
R	T	Check data transfer to the central DB needed before the test starts
P	C	Help desk needed to support users

Table 3. VOLERE Tool – Italy (Turin)

TEST SITE	Turin	
LFOT	DFOT	
ISSUE	TYPE	DESCRIPTION
L	T	For traffic information test: traffic data must be simulated in order to make the test repeatable and possible to evaluate correctly
R	U	At least a part of the road used for the test must be fixed and decided a priori
R	U	The driver must be alone during the test in order to avoid external influence
R	T	For speed camera alert test: speed camera database must be available and updated for the whole area of testing
R	U	Drivers with >3 years driving experience, 25-55 years old. >10000km/year driving experience.
L	T	Limited GPS signal inside tunnels

Table 4. VOLERE Tool – Spain (Madrid)

TEST SITE	Madrid	
LFOT	LFOT2	
ISSUE	TYPE	DESCRIPTION
R	T	Real time traffic data must be available in the whole area of testing
L	L	Data protection issues limitations should be taken into account in each country
R	T	A new API needed to be designed to integrate the real time traffic data into the VEXIA device used in Madrid

P	T	The availability of reat time traffic data in the city of Madrid makes it possible to test this application within TeleFOT
R	C	A GPRS data connection is needed in order to send the data form the vehicle to the control centre
R	O	The recruiting process might not have been as successful as expected

2.2 The MANTIS Tool – original data

The MANTIS Tool is describerd in detail in Annex B. The classification items used are the following:

TYPE	
T → Technical	
C → Communications	
L → Legal	
U → User	
O → Other	
SEVERITY	
Minor	
Major	
Crash	
CATEGORY	
Functions	
Plans	
Fot Execution	
Test tools/devices	

The MANTIS Tool has also been used for SP3 activities in order to provide all the Test site managers with information about both problems and the related solutions. And that information is visible in the tables below.

However, it should be noted that for the compilation made in this deliverable (in the next section) only the problems encountered have been used.

Table 5. MANTIS Tool – Sweden, Finland, Greece, Italy, Spain

TEST SITE	Sweden			
LFOT	LFOT1			
TYPE	**SEVERITY**	**CATEGORY**	**PROBLEM DESCRIPTION**	**SOLUTION ENCOUNTERED**
O	major	Test tools/devices	The company delivering the service did work with an old specification of the common data format for TeleFOT	The work had to be done at an extra cost
U	major	Plans	Recruitment of participants more difficult thatn expected	Extra functionallity as an incentive to participate
T	major	Plans	The service provider had problems delivering equipment	The issue have been the reponsibility of the byers if the equipment, but causes delays

TEST SITE	Sweden			
LFOT	LFOT2			
TYPE	**SEVERITY**	**CATEGORY**	**PROBLEM DESCRIPTION**	**SOLUTION ENCOUNTERED**
O	minor	Fot execution	Serveral questionnaires got stuck in spam filters	the questionnaires had to be sent manually, a new procedure for ensuring that the questionnaires had reached the participants have been adopted

TEST SITE	Sweden			
LFOT	LFOT3			
TYPE	**SEVERITY**	**CATEGORY**	**PROBLEM DESCRIPTION**	**SOLUTION ENCOUNTERED**
T	Minor	Fot execution	Due to the FOT starting very early in in the project, the data is not in the common format, and there are no baseline data	The data have been uploaded in a separate data table at the server

TEST SITE	Sweden			
LFOT	LFOT4			
TYPE	SEVERITY	CATEGORY	PROBLEM DESCRIPTION	SOLUTION ENCOUNTERED
T	Minor	Function	The service did not work as expeced from start	Extra mail and gifts, encuraging pilots to test again
C	Minor	Execution	Limesrurvey tool was not configured to send mail in a correct way	Appr. 100 intersted Pilots could not participate since they never got mail
O	minor	Fot execution	Serveral questionnaires got stuck in spam filters	the questionnaires had to be sent manually, a new procedure for ensuring that the questionnaires had reached the participants have been adopted

TEST SITE	Finland			
LFOT	LFOT1			
TYPE	**SEVERITY**	**CATEGORY**	**PROBLEM DESCRIPTION**	**SOLUTION ENCOUNTERED**
Other	Major	Plans	Recruitment is not as effective as originally planned.	Test site enlarged from city of Oulu to Tampere and Helsinki
Technical	Major	Plans	Integration of the different solutions on the phone and in the vehicle takes more time than planned	Timetable moved
technical	Major	FOT execution	Wide variety of phones and vehicles makes support challenging	
Technical	major	Test tools	The Function to be tested on phone may interact with other functionalities, which may cause undesired effects(e.g. SMS messages are acknowledged without user knowledge)	the SMS interaction problem was solved by removing the SMS reader functionality from the LATIS function
Technical	major	FOT execution	Service operators are not able to reproduce problems reported by the test users, due to wide variety of phones, possible phone settings or telecom service contracts	
Technical	major	Functions	Both DRIVECO and LATIS cannot start completely automatically on the phone	After extensive research, the solution is that LATIS works always in the background and activates when Bluetooth connection to DRIVECO module is detected. Activation of DRIVECO requires one button push of the test user
Technical	major	functions	Communication strategies may severely impact phone battery use	After extensive research, a solution has been found which consumes the battery only minimal. The LATIS service checks at regular intervals if the DRIVECO module is visible, and then activates.
Technical	major	user	test users are not able to install by themselves the tools	information package and briefing sessions have been organised. Test users are assisted in installing the software and equipment.
Function	minor	Functions	availability of winter speed data	data retrieved from Finnish Transport Safety Agency and implemented in function
Function	minor	Functions	Third party, responsible for delivering traffic information, did not deliver data temporarily.	Contact made with the service provider once the problem was noticed and data again made available
Technical	minor	Functions	test users face problems with the vehicle, and wonder if this can be caused by the OBD-II module	The problem is discussed with and assessed by the device manufacturer. The device complies with all regulations, and should not interact with vehicle electronics. The problem may be due to software problems in the vehicle.

TEST SITE	Greece			
LFOT				
TYPE	SEVERITY	CATEGORY	PROBLEM DESCRIPTION	SOLUTION ENCOUNTERED
Technical	Major	Test tools/devices	The second battery(assited battery) has to recharged after each test took place.This battery is responsible for the power supply of industrial PCs, camera and the whole equipent at the vehicle's trunk	The second battery(assited battery) has to recharged after each test took place.
Communication	Major	Test tools/devices	The Windows Mobile device (Samsung) has to be synchronized with both PCs.The PC which collects the C.A.N. bus signals and the PC which controls the camera and records the driver.	Using Active Sync for PDA and C.A.N. data PC. Using TimeSync Application for synchronizing both PCs via local internet (C.A.N. data PC and Camera PC).

TEST SITE	Reggio Emilia			
LFOT	LFOT			
TYPE	SEVERITY	CATEGOR	PROBLEM DESCRIPTION	SOLUTION ENCOUNTERED
T	Major	Test tools/de	On some devices the navigation sw crashed. Note: Whenever a device crashes, the time the device cannot be used should be tracked.	The help desk either provided phone support or scheduled onsite technical support
U	Minor	Plans	Some users dropped off or were left out of the sample after filling in the background questionnaires e.g. some of them had an embedded navigation system on their cars	Recruitment actions were re-started
U	Major	Fot Execution	Some travel diaries were not returned by mail	The help desk solicited the filling in of the missing travel diaries
U	Major	Fot Execution	Some questionanires were not returned	The help desk solicited the filling in of the missing questionnaires

TEST SITE	Turin			
LFOT	DFOT			
TYPE	SEVERITY	CATEGOR	PROBLEM DESCRIPTION	SOLUTION ENCOUNTERED
T	Minor	Functions	Real time traffic info are not always available in the test area, in this case the results of the testing of this function are difficult to evaluate	Traffic info will be simulated
L	Crash	Fot Executic	Drivers must be authorized to drive test car with trail plate	Only company (CRF and Magneti Marelli) employees would be used for the test
T	Minor	Test tools	Syncronization between log file of PND, Blue&me and PC	Tests in CANape and refined architecture of the tests
T	Major	Test tools	Impossibility to log driver attention data for the total duration of the test	New versions of CAA In alternative: experimenter on-board.

TEST SITE	Madrid			
LFOT	LFOT2			
TYPE	SEVERITY	CATEGORY	PROBLEM DESCRIPTION	SOLUTION ENCOUNTERED
O	Crash	Plans	The company collaborating with ETRA in Valencia test site is not able to provide the necessary amount of test users, therefore the Large scale FOT can not be performed in Valencia.	The LFOT2 was moved from Valencia location to Madrid location in order to be able to perfome the Large Scale Tests. A new third company - CRAMBO - has been contacted to participate in Madrid LFOT
L	Major	Execution	The third company participating in Madrid LFOT is not confident in providing all the data from the drivers to be analysed by the consortium.	The company agreed on providing the raw data from a sample of drivers and providing the already processed data from the rest of the drivers. ETRA will be in charge of the data pre-processing, acording to the consortium data processing procedures

3 Compilation of results

The VOLERE and MANTIS tools have been used to collect data in accordance with a given structure. The tools are described in the Annexes A and B and in principle the classification used can be seen as following the natural course of actions when preparing an FOT, i.e. start with the choice of functions to be tested, derive a plan for the tests including the test tools to be used (in principle the study design) and finally the FOT execution.

This structure is not following all the steps of the FOTIP Checklist, but is more pragmatic in its nature. It can be seen as a bottom-up approach to list the crucial issues identified by local actors in the test sites in comparison with the FOTIP Checklist that can be seen as the result of a generic top-down approach; somewhat of a desk study list of issues.

The data collected from the partners was not complete. The tools only been used by about half of the Test site managers. This might imply that the compilation and structuring of the comments made below are only of limited value. However, Indirect comments on the type of issues to be covered by this deliverable show that the data collected (see the tables in chapter 2) are quite representative for the TeleFOT as a whole. And of course a revised version could have been prepared at a later stage if the opportunities and the resources had allowed it.

The titles of the sections below are directly taken from the FESTA FOTIP Checklist entries (Annex C). This is done to relate the issues identified by the Test site managers (following the templates of the VOLERE and MANTIS Tools) to the 22 different segments of the Checklist.

This is in reality a test of the feasibility of the FOTIP Checklist for planning, organising and running an FOT and it is quite obvious that the Checklist have a management approach, where several of the items in the beginning of the Checklist are not the most relevant ones for advice when it comes to the planning, function choice, test tools choice and FOT execution in reality. The following list (prepared based on the VOLERE and MANTIS raw data) has a focus on hands-on issues meeting the Test Site managers and their teams. The most important ones (for each issue) are highlighted in bold.

Even if the FOTs in TeleFOT only have passed the Pilot Test entry in the Check list, the real world design and execution of an FOT does need a dedicated approach which mirror the specifics of the local FOT addressed. The advices given in the Checklist are too generic and must be adapted to the local circumstances and contexts.

3.1 Identify and solve legal and ethical issues

The legal and ethical issues must be taken care of very early in the process of designing an FOT. The following items (in no specific order) have been identified in TeleFOT FOTs

- ✓ *User agreement needs to be signed before the test starts*
- ✓ Tax issues should be taken into account for test user incentives, e.g. it may not be allowed to offer the devices for free to the test users at the end of the test period
- ✓ Service providers, not included in the TeleFOT consortium, may be required to make modifications to their software in order to allow the test regimes (reference period, actual test) and to store the information needed for TeleFOT. These activities should be agreed before making the contract with the service provider.
- ✓ Data on speed limit (especially winter speed) do not change on the same moment in the function as in real life.
- ✓ Tailoring of the services to integrate logging with the service provision may require much more time than expected
- ✓ *Data protection regarding the use of personal data should be prepared and made available to potential test users*
- ✓ *Data protection issues should be taken into account in each country*

3.2 Select and obtain systems and functions to be evaluated

3.3 Select and obtain data collection and transfer systems

3.4 Select and obtain support systems for FOT platforms

The systems and functions to be evaluated are in TeleFOT based on mobile platforms of different types. Smartphones of different brands as well as personal navigators, etc. provide a wide spectrum of designs (HMI, technical specifications, etc.) that will make it difficult to find a common denominator in the tests to be performed. Therefore three of

the Checklist entries are brought together to manifest the interlinks between the functions, the data collection and relevant support systems for the FOT platforms.

- ✓ *Wide variety of phones makes support difficult and challenging*
- ✓ *The Function to be tested on phone may interact with other functionalities, which may cause undesired effects* (e.g. SMS messages are acknowledged without user knowledge)
- ✓ Service operators are not able to reproduce problems reported by the test users, due to wide variety of phones, possible phone settings or telecom service contracts
- ✓ In-vehicle embedded navigators should not be used during the FOT, neither in the Test nor in the Control Group
- ✓ Service operators are not able to reproduce problems reported by the test users, due to wide variety of phones, possible phone settings or telecom service contracts
- ✓ The Windows Mobile device (Samsung) has to be synchronized with both PCs. The PC which collects the C.A.N. bus signals and the PC which controls the camera and records the driver.
- ✓ *Real time traffic data must be available in the whole area of testing*
- ✓ A new API needed to be designed to integrate the real time traffic data into the VEXIA device used in Madrid
- ✓ The availability of real time traffic data in the city of Madrid makes it possible to test this application within TeleFOT
- ✓ A GPRS data connection is needed in order to send the data form the vehicle to the control centre

3.5 Implement driver feedback and reporting systems

In this context *the use also of subjective measures and data collection means like questionnaires, travel diaries, etc. must be covered*. This is unfortunately not very visible in the Checklist material and there is a need to highlight this in the future.

- ✓ The OBD-2 interface may be located in a place where the OBD-2 module or the connection cable cannot be attached without being able to put the dashboard back in its place, which may be an issue for the user

- ✓ The OBD-2 interface may be located in a place where the OBD-2 module or the connection cable cannot be attached without being able to put the dashboard back in its place, which may be an issue for the user

3.6 Select/implement relational database for storing FOT data

The database handling is important to be included in the whole data flow from sensors to final analysis. There has been *an "invention" made in TeleFOT – the Data Working Group – that has taken care of all data issues over the different phases of TeleFOT*. This is probably why such issues are not that frequent among the topics addressed as could have been expected.

- ✓ OBD-2 interface locations differs in vehicles. Information on the location can be retrieved through use of database
- ✓ Check data transfer to the central DB needed before the test starts

3.7 Test all systems against functional requirements and performance specifications

This step in the Checklist is important as it will focus on every single element to be used in the realisation of an FOT and check if the functionality is OK and that the different units perform as expected. This is quite different from the pilot test and its main purpose is to lay out the process to test the technology before it is implemented in a wider context together with participants if the tests (the human element).

- ✓ The service did not work as expected from start
- ✓ *Integration of the different solutions on the phone and in the vehicle takes more time than planned*
- ✓ *Different logging and communication strategies may severely impact the use of battery of the nomadic device*
- ✓ Both DRIVECO and LATIS cannot start completely automatically on the phone
- ✓ Availability of winter speed data
- ✓ Third party, responsible for delivering traffic information, did not deliver data temporarily.
- ✓ Test users face problems with the vehicle, and wonder if this can be caused by the OBD-II module

- ✓ Limited GPS signal inside tunnels
- ✓ *Users may change phone, new phone does not necessarily support functions to be tested*
- ✓ Pressing one button at the start of each ride may be an issue for the test user

3.8 Develop recruitment strategy and materials

The recruitment of participants is crucial and as is seen from the reports made that it could be a very time consuming exercise.

- ✓ *Recruitment of participants more difficult than expected*
- ✓ Recruitment is not as effective as originally planned.
- ✓ Recruitment may not be as effective as estimated
- ✓ The company collaborating with ETRA in Valencia is not able to provide the necessary amount of test users, therefore the L- FOT cannot be performed in Valencia.
- ✓ *Some users dropped off or were left out of the sample after filling in the background questionnaires,* e.g. some of them had an embedded navigation system on their cars
- ✓ Drivers must be authorized to drive test car with trail plate
- ✓ Users of reference group should have benefit from the tests

3.9 Pilot test FOT equipment, methods and procedures

Finally, the last topics addressed in relation to WP2.4 is the piloting phase, where in small scale a “mini-FOT” is performed with all its elements, technical as well as human, and the whole FOT procedure is at stake. This is done and performed at a higher system level than just testing the bits and pieces of the FOT design. This gave time for (at a rather low cost) to make the last minute changes to the different elements of the forth-coming FOT execution and evaluation.

- ✓ The company delivering the service did work with an old specification of the common data format for TeleFOT
- ✓ *The Function to be tested on phone may interact with other functionalities, which may cause undesired effects* (e.g. SMS messages are acknowledged without user knowledge)

- ✓ On some devices the navigation sw crashed. Note: Whenever a device crashes, the time the device cannot be used should be tracked.
- ✓ Impossibility to log driver attention data for the total duration of the test
- ✓ The second battery (assisted battery) has to recharged after each test took place.
- ✓ Lime survey tool was not configured to send mail in a correct way
- ✓ *Several questionnaires got stuck in spam filters*
- ✓ *Some travel diaries were not returned by mail*
- ✓ Some questionnaires were not returned

4 Discussion

The compilation of comments in chapter 3 shows that only 9 out of 22 issues of the FOTIP Checklist are addressed. Bearing in mind that the FOT executions just had started in some Test sites, in principle only half of the FOTIP Checklist items are not covered by direct inputs “from the field”. In each of the 9 issues now covered some items can be selected that highlight what topics are most important when realising an FOT.

When it comes to legal and ethical issues, there is an emphasis on the user agreement and that it needs to be signed before the test starts. The importance is further demonstrated as data protections and use of personal data must be handled in a way that mirror the legislation in every country involved in the tests. This is a topic that must be addressed at the very start of the project; not least because it can take some time to find the correct wording, etc. in the documents to be signed.

In the next phase the systems and functions to be evaluated have to be selected. As the data collection and transfer systems sometimes are dependent on the functions and systems used they have also to be selected (together with support systems for the FOT platforms) as early as possible as well. For instance, there are a wide variety of nomadic devices (smartphones, personal navigators, etc.) available in the market and the technological development is fast. This can make the planning of the FOT difficult and challenging. For instance, the function to be tested on a phone might interact with other functionalities and cause undesired effects. When support systems are concerned, one example of a topic to address is the availability of real time traffic data in the whole area of testing.

There are also other “support systems” that must be implemented when the final study design is to be addressed, and that is the driver feedback and reporting systems. As it is quite evident that the impacts of the use of nomadic devices on efficiency, environment, mobility, safety and the related user uptake will make use of data collection means like questionnaires, travel diaries, etc. the process of using web-based versions of these tools must be prepared at an early stage. Furthermore, the whole process of handling the collection of data (both objective and subjective) must be handled in a systematic way. The introduction of a Data Working Group in TeleFOT, spanning over several phases of the FOT activities, is a good example of a solution that has been able to meet almost all challenges in the data acquisition process on an FOT.

Before the pilot testing of the FOT set-up is performed a test of all systems against functional requirements and performance specifications must be made. It is important to check whether the different logging and communication strategies may severely impact the use of battery of the nomadic devices to be used. It is also necessary to test that the integration of different technical systems is possible. And at this point it might be necessary to make a final decision on what type of nomadic devices (models, functionalities, etc.) that will be used in the FOT. The risk is that not all the functions to be tested are supported. Other system elements in the FOT set-up are the participants in the test. The time and effort needed for the recruitment cannot be over-estimated. Strategies must be developed, especially on how to handle drop-outs during the FOT execution itself.

Finally, pilot tests of FOT equipment, methods and procedures must be given both ample time and resources to be performed properly. It is important to test (in full operation) that the functions to be tested do not interact with other functionalities in a negative way. It is also important to follow the whole data flow chain from the sensors to the database handling and the extraction of data for further analyses. When web-based “sensors” are concerned, it is important that questionnaires, etc. are not stuck in spam filters. Finally, it must be emphasise again that the time spent on pilot testing can be very rewarding. Last minute changes and modifications of the study design, etc. can be made relatively easy and make the FOT into a successful exercise.

5 Concluding remarks

This deliverable has not adhered to the original plan to the detail, but under the circumstances it has collected and compiled information that can be of use in future FOT endeavours. The tools VOLERE and MANTIS has proven their usefulness in the sense that they are able to capture examples of issues emanating from a bottom-up approach to the first phases of preparing and planning an FOT. The top-down approach to FOTs, demonstrated by the FESTA Handbook (version 5.0) is of course the generic backbone of FOT activities, but the specifics of every FOT has to be addressed as well and examples of how that can be accomplished is shown in this deliverable.

6 Reference list

Reports from the FESTA project, all of which are available at http://www.its.leeds.ac.uk/festa/downloads.php

The FESTA Handbook (version 5.0), July 2011

The Volere Tool (Annex A)

The Mantis Tool (Annex B)

ANNEXES

ANNEX A

The VOLERE Tool

Volere Tool description

The Volere methodology based tool has been developed by ETRA and offered to TeleFOT project for its usage. This took helps project partners to describe, formalize and track the project requirements, potentials and limitations in an explicit and unambiguous manner. The use of Volere methodology was selected for the following three reasons:

1. The Volere methodology requires simple steps to identify and formalize the requirements in an unambiguous manner.
2. The Volere methodology provides an easy process to track and evaluate the progress of the project.

The consequent application of the Volere methodology is not only useful in the initial phases of the project for specifying requirements but it is also helpful in specifying a reference point for the later stages. During the use case analysis, for example, it can be used to ensure that different use cases cover different aspects of the requirements and that all important requirements are covered by them. During the implementation and management, it can be used to track and evaluate the progress of the individual work packages and the overall project. Besides being efficient and easy to use, the Volere methodology provides a mechanism for all partners to specify the requirements in a standard format. Thereby, specifying additional context of a requirement such as the rationale and the acceptance criteria for every requirement helps to build a common understanding of the overall system. Furthermore, defining priorities helps to clarify the focus of the project.

Requirement Prioritization

In order to prioritize requirements, the project consortium has introduced three different classes of priorities. These classes range from one (high) over two (medium) to three (low) and the consortium has defined them as follows:

1. High: Requirements in this class are either realizing a key innovation of the project or they are needed to realize it. These requirements are necessary to achieve the goals of the project.
2. Medium: Requirements in this class are not necessary to realize a key innovation but they are necessary or very helpful to realize the application prototypes. These requirements are important to the application developer.

3. Low: Requirements in this class are neither realizing a key innovation nor necessary for the application prototypes. However, in a broader context – possibly beyond the scope of the project – they may be important.

As a consequence, for the success of the project, it is essential to realize the requirements with high priority. With respect to providing thorough support for application developers, it is important to realize the requirements with medium priority as well. The requirements with low priority, however, are not of immediate relevance for the project. However, their realization may provide additional features or benefits for applications or users that should be considered after all requirements of the other two classes have been implemented successfully.

In order give all stake-holders and interested parties an insight into the prioritization process, the consortium has not only assigned categories to each requirement but it decided to include the main rationale for this classification in this document. Besides from being informative, this can be helpful in later stages of the project where unforeseeable issues may require the introduction of new requirements or changes to existing requirements.

Specification Tools

Aiming at defining an optimum and complete list of requirements, a web tool based on the Volere methodology was developed. This web tool has facilitated the definition, the validation and the prioritization of the requirements.

For security reasons, the access to the web tool has been restricted to authorized users. Anyone can fill in the registration form to request a valid user name and password. This request is processed by the administrator in ETRA who decides who must be granted access to the website.

If the administrator approves the request, then, an email with the user name and password is sent to the requester. From that moment, the user will be able to access the requirements definition website.

Access to the web tool is granted after a successful identification on the system. The application allows the administrator to control the status of the validation process from the initial definition to the final list of requirements passing through the required validation and revision status.

Specification Process

The overall process of Volere as supported by the web tool is depicted in the following figure. After an initial specification of requirements, the users can specify conflicts, dependencies and objections. After specifying them, they can iteratively revise the specification and identify additional issues until it is free of conflicts, dependencies and objections. The result will constitute the final list of requirements. The following subsections briefly outline the individual steps.

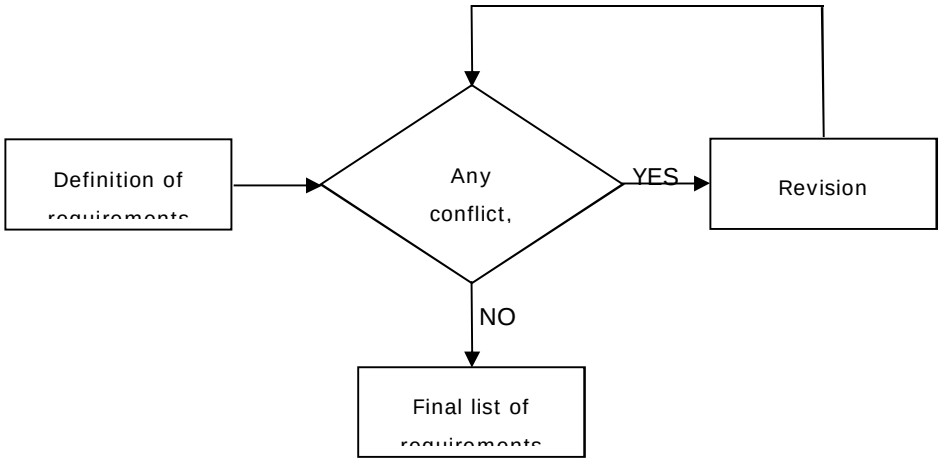


Figure 1: Requirement Specification and Validation Process

Requirement Definition

In this first stage all the requirements needed to accomplish the project objectives must be defined. These will be refined in future stages. The most useful information and the main functionalities at this stage available at the home page are (see the following figure):

- Create a new requirement: All the fields are required except for "Comments and supporting material" which is optional. The required fields are:
  - Id. Type: The scope of this requirement (general, context ontology, ...). Appended by an automatically generated sequential number, this ID uniquely identifies each requirement.
  - Description: A one sentence statement which describes the intention of the requirement.
  - Type: The type of the requirement as defined by Volere.
  - Rationale: A justification of the requirement.
  - Acceptance criteria: A measurement of the requirement for further verification that the solution matches the original requirement.

- Satisfaction: The grade of satisfaction for the customer if the requirement is successfully implemented.

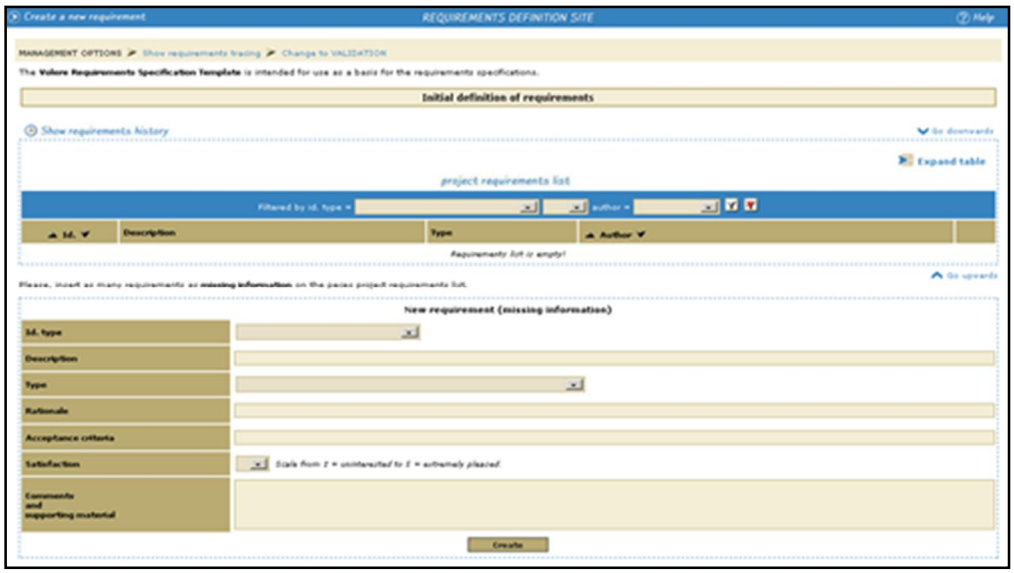


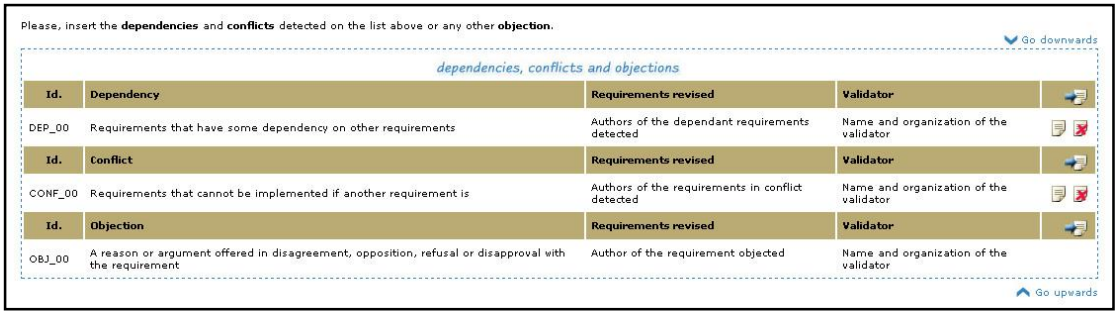
Figure 2: Definition of Requirements

- Help: An external link to Volere requirements specification template.
- List of requirements: The list of requirements with some additional options.
  - Filtering options: The list of requirements filtered by id. type and/or filtered by author.
  - Expand table: Show/hide some columns, displaying more or less information about the requirement.
- Requirements management: Modification options for requirements.
  - View a requirement
  - Edit a requirement (only available for the author)
  - Delete a requirement (only available for the author)
- Requirements tracing: After the first validation, a new service is made available for keeping track of all the requirements history.

Requirement Validation

After the initial definition of requirements, the validation process begins. All the requirements should be approved by all the users. At this stage, conflicts and dependencies between requirements must be detected. Furthermore, any objection must be pointed out (c.f. Figure):

- Dependency: Requirements that have some dependency on other requirements.
- Conflict: Requirements that cannot be implemented if another requirement is implemented or a conflict due to an insufficient definition of the requirement.
- Objection: A reason or argument offered in disagreement, opposition, refusal or disapproval of the requirement.


Please, insert the **dependencies** and **conflicts** detected on the list above or any other **objection**.

Go downwards

dependencies, conflicts and objections

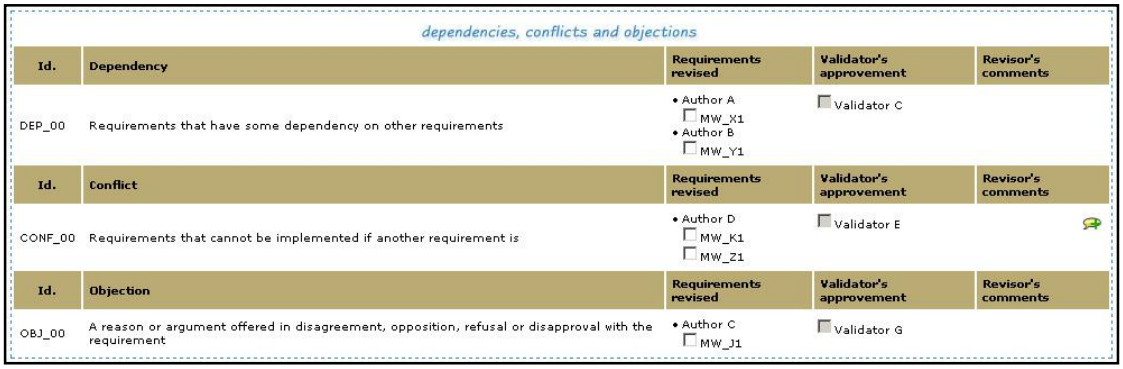
Id.	Dependency	Requirements revised	Validator	
DEP_00	Requirements that have some dependency on other requirements	Authors of the dependant requirements detected	Name and organization of the validator	
Id.	**Conflict**	**Requirements revised**	**Validator**	
CONF_00	Requirements that cannot be implemented if another requirement is	Authors of the requirements in conflict detected	Name and organization of the validator	
Id.	**Objection**	**Requirements revised**	**Validator**	
OBJ_00	A reason or argument offered in disagreement, opposition, refusal or disapproval with the requirement	Author of the requirement objected	Name and organization of the validator	

Go upwards

Figure 3: Validation of Requirements

Requirement Revision

All the dependencies, conflicts and objections encountered by the experts during the validation stage must be revised and solved. However, if the authors do not agree with the validator's opinion, then they can make use of the "Revisor's comments" option for pointing out their disagreement or clarifying the intention of the requirement. Note that only the authors of the requirements that have to be revised are able to add comments to the dependency, conflict or objection.



dependencies, conflicts and objections

Id.	Dependency	Requirements revised	Validator's approvement	Revisor's comments
DEP_00	Requirements that have some dependency on other requirements	• Author A MW_X1 • Author B MW_Y1	Validator C	

Id.	Conflict	Requirements revised	Validator's approvement	Revisor's comments
CONF_00	Requirements that cannot be implemented if another requirement is	• Author D MW_K1 MW_Z1	Validator E	

Id.	Objection	Requirements revised	Validator's approvement	Revisor's comments
OBJ_00	A reason or argument offered in disagreement, opposition, refusal or disapproval with the requirement	• Author C MW_J1	Validator G	

Figure 4: Revision of Requirements

The checkboxes in "Requirements revised" column and "Validator's approvement" column help the users to check the status of the revision and together with the possibility of adding comments facilitate the interaction and communication between the author and the validator. For security reasons, the checkboxes on the "Requirements revised" column are only enabled for the authors of the requirements who have also enabled the possibility of adding comments. Moreover, for the same reason, the checkboxes on the "Validator's approvement" column are enabled only for the author of the validation.

The revision process consists of four steps:

- Firstly, the authors should identify which requirements have been objected to or are involved in any conflict or dependency.
- Secondly and after analyzing the validator's opinion:
  - The author may agree with the validator and proceed to modify or delete the requirement.
  - The author may disagree with the validator, therefore he/she should make appropriate comments trying to clarify the requirement with a better explanation or justify the intention of the requirement.
- Thirdly, the author should mark the checkbox of the requirement as revised.
- Finally, the validator should be aware of the revised requirements and approve the actions taken by the author for resolving the dependency/conflict/objection.

ANNEX B

The MANTIS Tool

MANTIS Tool Description

Mantis Bug Tracker is a free and open source web-based bug tracking system released under the terms of the GNU General Public License version 2. The most common use of MantisBT is to track software defects. However, MantisBT is often configured by users to serve as a more generic issue tracking system and project management tool.

One of the main advantages of this tool is that is completely configurable, giving the possibility to use only the features needed for each case it wants to be used.

What is it?

Mantis is a web based bugtracking system. It is currently in development and is considered a beta.

It is written in the PHP scripting language and requires a MySQL database and a webserver. Mantis has been installed on Windows, MacOS, OS/2, and a variety of Unix operating systems. Any web browser should be able to function as a client. It is released under the terms of the GNU General Public License (GPL).

Mantis is free to use and modify. It is free to redistribute as long as you abide by the distribution terms of the GPL.

Features and Benefits

- Free
- Easy to install
- Web based
- Platform independent
- Multiple projects
- Multiple languages
- Emailing
- Simple Search
- Viewing filters
- PHP4

Goals

The goals for this project are to produce and maintain a lightweight, simple bugtracking system. Additions of complexity/features are modular so that users can be shielded from unwanted clutter. Thus, much of the package has a simple version of a feature along with a more fully developed version.

In the 'core' package the goal is to have the most important, most used, most time saving portions of a bugtracking system. The product is designed to be easily modifiable, customizable, and upgradeable. Anyone with intermediate PHP and MySQL experience should be able to customize Mantis to suit their needs.

Features

Plug-ins

An event-driven plug-in system was introduced with the release of version 1.2.0. This plug-in system allows extension of MantisBT through both officially maintained and third party plug-ins. As of January 2010, there are over 20 plug-ins available on the MantisBT community Git repository hosting service, MantisForge.

Prior to the plug-in system in version 1.2.0, a third party plug-in system created by Vincent Debout was available to users along with a variety of different plug-ins. This system was not officially supported by the MantisBT project and is incompatible with the plug-in system provided with version 1.2.0 of MantisBT.

Notifications

MantisBT supports the sending of e-mail notifications upon changes being made to the system. Users have the ability to specify the type of e-mails they receive and set filters to define the minimum severity of issues to receive notifications about. Users also have the ability to explicitly subscribe to issues that affect them.

RSS feeds are available for users who wish to keep track of issues that have been resolved. Additionally, MantisBT has integration with Twitter to allow a notification to be tweeted when an issue is resolved.

Via MantisBT's event-driven plug-in system, it is possible to extend the built in notification support to run advanced scripts that perform additional notification actions (such as sending SMS messages or updating statuses in external project management systems).

Revision control system integration

Versions of MantisBT prior to 1.2.0 allowed for limited integration with the CVS revision control system.[7] With the introduction of plug-in capabilities in MantisBT 1.2.0, revision control integration was redeveloped by John Reese in the SourceIntegration plugin.

As of January 2010, SourceIntegration allows for integration with the following revision control tools and web-based providers:

- Gitweb, a free and open source web interface for Git repositories
- GitHub, an open-source software hosting facility that hosts Git repositories
- WebSVN, a free and open source web interface for Subversion repositories
- SourceForge (for Subversion integration only), an open-source software hosting facility that hosts various types of software repositories

Upon committing changesets to a source code repository, post-commit hooks within Git or Subversion can be configured to automatically notify MantisBT that changes have been made to the repository. GitHub is also capable of remotely notifying a MantisBT installation of changes to a source code repository. Another technique used for integrating MantisBT with web-based source code hosting providers is the use of a job scheduler such as cron to manually check for changes to a repository every few minutes, reporting any changes back to MantisBT.

SourceIntegration allows for issues within MantisBT to be automatically resolved when a changeset message contains special strings such as "Fixes #12345". This also allows for relationships to be automatically created between changesets and issues recorded in MantisBT. Multiple issue IDs can

be specified in a single changeset message, although this is commonly discouraged as it indicates the changeset doesn't have a single, clear and logical purpose.

Tool Description

Login page

Just enter your username and password and hit the login button. There is also a Save Login checkbox to have the package remember that you are logged in between browser sessions. You will have to have cookies enabled to login.

If the account doesn't exist, the account is disabled, or the password is incorrect then you will remain at the login page. An error message will be displayed.

The administrator may allow users to sign up for their own accounts. If so, a link to Signup for your own account will be available.

The administrator may also have annonymous login allowed. Annonymous users will be logged in under a common account.

You will be allowed to select a project to work in after logging in. You can make a project your default selection from the Select Project screen or from your Account Options.

Signup
Here you can signup for a new account. You must supply a valid email address and select a unique username. Your randomly generated password will be emailed to your email account. If Mantis is setup so that the email password is not to be emailed, newly generated accounts will have an empty password.

Main page

This is the first page you see upon logging in. It shows you the latest news updates for the bugtracker. This is a simple news module (based off of work by Scott Roberts) and is to keep users abreast of changes in the bugtracker or project. Some news postings are specific to projects and others are global across the entire bugtracker. This is set at the time of posting in the Edit News section.

The number of news posts is controlled by a global variable. When the number of posts is more than the limit, a link to show "older news" is displayed at the bottom. Similarly a "newer news" is displayed when you have clicked on "older news".

There is an Archives option at the bottom of the page to view all listings.

Archives

A title/date/poster listing of ALL past news articles will be listed here. Clicking on the link will bring up the specified article. This listing will also only display items that are either global or specific to the selected project.

View Bugs page

Here we can view the bug listings. The page has a set of viewing filters at the top and the bugs are listed below.

Filters

The filters control the behavior of the bug list. The filters are saved between browsing sessions but do not currently save sort order or direction.

If the number of bugs exceeds the "Show" count in the filter a set of navigation to go to "First", "Last", "Previous", "Next" and specific page numbers are added.

The Search field will look for simple keyword matches in the summary, description, steps to reproduce, additional information, bug id, or bug text id fields. It does not search through bugnotes.

Bug List

The bugs are listed in a table and the attributes are listed in the following order: priority, id, number of bugnotes, category, severity, status, last updated, and summary. Each (except for number of bugnotes) can be clicked on to sort by that column. Clicking again will reverse the direction of the sort. The default is to sort by last modification time, where the last modified bug appears at the top.

The bug id is a link that leads to a more detailed report about the bug. Depending on what you have set in your Account Preferences you will be sent to the simple or advanced view. You can also add bugnotes here.

The number in the bugnote count column will be bold if a bugnote has been added in the specified time frame. The addition of a bugnote will make the bugnote link of the bug appear in the unvisited state.

The text in the "Severity" column will be bold if the severity is major, crash, or block and the bug not resolved.

The text in the "Updated" column will be bold if the bug has changed in the last "Changed(hrs)" field which is specified in the viewing filters.

Each table row is color coded according to the bug status. The colors can be customised through Mantis Configuration.

Severities

- block - prevents further work/progress from being made
- crash - crashes the application or OS
- major - major bug
- minor - minor bug
- tweak - needs tweaking
- trivial - being nitpicky

Status

- new - new bugs
- feedback - bug requires more information, the original posters should pay attention acknowledged - bug has been looked at but not confirmed or assigned
- confirmed - confirmed and reproducible (typically set by an Updater or other Developer)

- assigned - assigned to a Developer
- resolved - bug should be fixed, waiting on confirmation of fix
- closed - bug is closed

Moving the mouse over the status text will show the resolution as a title. This is rendered by some browsers as a bubble and in others as a status line text.

My account page

This page changes user alterable parameters for the system. These selections are user specific.

My Account

This allows the user to change their password, screen name, and email address. It also reports the user's access levels on the current and other projects.

Preferences

This sets the following information:

- Default project
- whether the pages used for reporting, viewing, and updating are the simple or advanced views
- the delay in minutes between refreshes of the view all bugs page
- the delay in seconds when redirecting from a confirmation page to the display page
- the time order in which notes will be sorted
- whether to filter email messages based on type of message and severity
- the number of notes to append to notification emails
- the default language for the system. The additional setting of "auto" will use the browser's default language for the system.

Profiles

Profiles are shortcuts to define the values for Platform, OS, and version. This page allows you to define and edit personal shortcuts.

Amore extended and complete manual of Mantis tool can be found at:

http://www.mantisbt.org/manual/

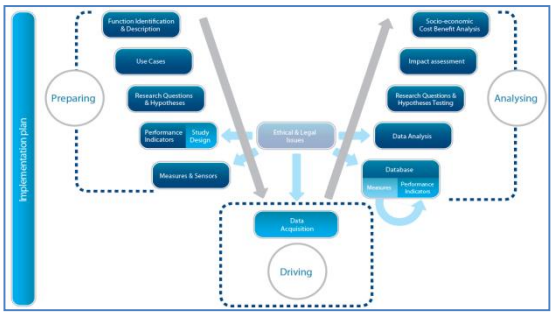
ANNEX C

Extracts from the FESTA Handbook (draft revised version)

Chapter 2: Planning and running an FOT

The FOTIP Checklist

Chapter 2: Planning and Running a Field Operational Test



Introduction

For a Field Operation Test (FOT) to proceed smoothly, a plan of action must be developed which documents the scientific, technical, administrative and procedural activities and tasks that are needed to successfully complete it. Given that the lifecycle of a FOT typically evolves through many phases, there are many issues to consider. In this chapter, the critical activities and tasks which are necessary to run a successful FOT are documented — in the form of a "FOT Implementation Plan" (FOTIP) — drawing on lessons learned from previous FOTs conducted in Europe, the United States, Japan, Australia and elsewhere.

The FOTIP is contained in 0 of the FESTA Handbook. In this chapter, the FOTIP is introduced, described, explained and discussed.

The FOT Implementation Plan

1.2.1 Purpose

The FOTIP is intended to serve primarily as a checklist for planning and running FOTs:

- to highlight the main Activities and Tasks that would normally be undertaken in successfully completing a FOT;
- to ensure that, in running a FOT, researchers and support teams are aware of critical issues that influence the success of the FOT; and
- by drawing on the experiences of previous FOTs, to highlight the "dos" and "don'ts" of running a FOT;
- to provide a consistent framework for planning, running and decommissioning FOTs.

The FOTIP presented in this Handbook is not intended to be prescriptive, but rather to serve as a generic guide in conducting FOTs. By their very nature FOTs are major projects – extensive and expensive. Significant previous FOTs that have not delivered

their anticipated outcomes have not done so primarily because of failures to anticipate problems that compromised their successful execution. The FOTIP attempts to map out all known critical issues that need to be taken into account in planning and undertaking a FOT.

The history of FOTs suggests that no two will be the same, and that there often are many unforeseen Tasks and Sub-Tasks that arise during its lifecycle. The list of Tasks and Sub-Tasks contained in the FOTIP in 0of this Handbook is not, therefore, exhaustive. It is based on the collective wisdom of those that have been involved in planning and running previous FOTs. There may be specific requirements for future FOTs conducted in Europe that will need to be decided on a case-by-case basis.

The FOTIP at 0describes *what* needs to be done, and approximately *when*, in running a successful FOT. Other relevant chapters in the FESTA handbook describe in detail *why* these activities are necessary and *how* they are to be accomplished.

1.2.2 Description of the FOT Implementation Plan

The FOTIP in 0of this Handbook resembles a traditional Work Breakdown Structure (WBS), but without timelines. It is specifically designed in this way so that timelines can be inserted at a later date by those responsible for the overall planning and running of the FOT.

The FOTIP is divided into three columns and two sections below each activity:

- Column 1 — Activities. An Activity is a high level task e.g. “Convene FOT research and support teams” that is usually needed to run a FOT.
- Column 2 — Tasks and Sub-Tasks. A Task directly supports an Activity e.g. “Appoint FOT project manager”. A Sub-Task directly supports a Task. Essentially, this column contains a series of action statements – “do this”; “do that”; etc. There are very few sub-tasks listed in this column, to contain the size of the document. The document is cross-referenced to other chapters of the FESTA Handbook, which identify the relevant Sub-Tasks that support these Tasks.
- Column 3 — Person/Organisation Responsible for Activity. This column identifies the person, team, organisation or combination thereof that would usually be responsible for completion of a Task. The FOT project manager is ultimately accountable for successful completion of all Tasks, and is therefore included for every Task.

- After section 1 – Critical Considerations (the "dos" and "don'ts"). This column contains critical advice for ensuring that an Activity or Task is successfully completed. e.g. "Be sure that the vehicle systems are designed so they do not drain the battery when the vehicle engine is not running." e.g. "Do not underestimate the amount of time required to recruit company drivers for the FOT."

- After section 2 – General Advice. This column provides general advice on how to maximise the likelihood of running a successful FOT e.g. "The FOT lifecycle is long. Hence, it is advisable to write separate reports on each critical stage of the FOT…" This column also contains explanatory notes, reference to other relevant documents (e.g., FOT reports) and cross-referencing to other chapters in the FESTA Handbook.

The Activities and Tasks identified in the FOTIP are consistent with those identified in the higher level "FOT Chain" that is described in the FESTA Handbook, although the chronological order in which the Activities and Tasks are shown varies slightly between the two. For example, in the FOT Chain it is assumed that the first step when planning an FOT is the identification of systems and functions to be analysed. In the FOTIP, on the other hand, this task is identified later in the sequence of planning activities (within Activity 2), as there are other planning activities and tasks that necessarily precede the identification of systems and functions to be analysed. The FOTIP identifies the scientific, technical, administrative and procedural activities for planning and running an FOT; the FOT chain summarizes the key, high level, scientific and technical steps undertaken when performing an FOT, and the sequential links between them.

1.2.3 Development of FOT Implementation Plan

The content of the FOT Implementation Plan derives from several research activities undertaken in Work Package 2.5 of the FESTA project:

- a comprehensive review of the literature on previous FOTs undertaken in different parts of the world: the United States and Canada; the Asia-Pacific region (including Australia and Japan); Europe; and Scandinavia. This included reference to FOT project plans, internal reports, meeting minutes and related documents, where possible. A special literature review of FOTs of nomadic devices was also undertaken, which encompassed all of these regions. References for the publicly available literature reviewed are listed at the end of the Handbook.

- a one-day workshop with FOT experts who had previously conducted FOTs, in Europe, the United States and Australia. This activity, along with the outputs of the literature reviews, identified critical Activities, Tasks and Sub-Tasks for

successfully conducting FOTs, as well as the practical “dos” and “don’ts” of carrying out FOTs;

- an international teleconference with experts with experience in conducting FOTs and naturalistic driving studies. This augmented the information derived from the workshop;
- written feedback from FOT experts, who commented on an earlier draft of the FOT Implementation Plan;
- internal consultation with other FESTA Work package leaders, to identify critical scientific, technical and administrative activities arising from other FESTA research activities undertaken in developing other chapters of the FESTA Handbook; and
- Feedback received in FOT-Net.

1.2.4 Assumptions underlying the FOT Implementation Plan

There is no one way of conducting a successful FOT. The review of the literature on FOTs revealed that many different approaches have been taken in planning, running, analysing and decommissioning FOTs. The FOTIP in 0of the FESTA Handbook draws together procedural activities that are most common to the known FOTs that have been conducted, and the collective wisdom of those who conducted them.

The FOT Implementation Plan is relevant to FOTs in which the ADAS and IVIS systems to be evaluated already exist as production systems in vehicles, or to studies in which the systems to be evaluated must be chosen by the FOT project team, purchased or developed, and installed (e.g., as in Regan et al., 2006).

The FOT Implementation Plan provides only a general guide to the sequence in which Activities, Tasks and Sub-Tasks should be performed. Some need to happen early in the project and others at the end. Some need to immediately precede others. Other tasks need to proceed concurrently with others. Decisions about the scheduling of Activities, Tasks and Sub-Tasks are the responsibility of the FOT Project Manager. Table lists the 22 Activities identified in the FOTIP, and highlights the main dependencies that exist between them. Within Activities, it is up to the FOT Project manager to further decide which Tasks and Sub-Tasks should proceed sequentially and in parallel.

Some of the major Tasks listed in the FOTIP (e.g. “recruit participants”, within the Activity “Run FOT”) are given only a one-line description and, as such, may appear to be down played in the plan. A judgement had to be made about how much detail to include

in the FOTIP. Where such one-liners exist, this is because either the Task in question is one that most researchers would normally be familiar with (e.g., recruiting study participants) or because the Sub-Tasks involved are described in detail in other Chapters of the FESTA Handbook. Where appropriate, any known difficulties and concerns associated with major Tasks for which only a one-line description is given are emphasised.

Table 1: A generic guide to scheduling the 22 Activities described in the FOTIP (The FESTA Handbook (version 5.0)).

	Set Up/Design		Preparation			Data Collection			Completion	
Convene teams and people										
Define aims, objectives, research questions & hypotheses										
Develop project management plan										
Implement procedures and protocols for communicating with stakeholders										
Design the study										
Identify and resolve legal and ethical issues										
Select and obtain FOT test platforms (vehicles, mobile devices, road side units, ...)										
Select and obtain systems and functions to be evaluated										
Select and obtain data collection and transfer systems										
Select and obtain support systems for FOT platforms										
Equip FOT test platforms with all systems										
Implement driver feedback and reporting systems										
Select / implement relational database for storing FOT data										
Test all systems against functional requirements and performance specifications										
Develop recruitment strategy and materials										
Develop driver training and briefing materials										
Pilot test FOT equipment, methods and procedures										
Run the FOT										
Analyse FOT data										

Write minutes and reports										
Disseminate the FOT findings										
Decommission the FOT										

1.2.5 Using the FOT Implementation Plan

It is suggested that the FOTIP be used as follows:

- read through the FOTIP before starting to plan a FOT;
- use the FOTIP as a checklist for guiding the planning, design and running of the FOT — and as a quality control mechanism for ensuring during the study that nothing critical has been forgotten;
- read the FOTIP in conjunction with other chapters in the FESTA Handbook, and refer to other chapters and other FOT reports for detail; and
- if desired, use the FOTIP as the basis for the development of GANTT charts and other project management tools.

FOT Implementation Plan (FOTIP) Checklist

To be read in conjunction with the related chapter of the FESTA Handbook (version 5.0) found in the first part of Annex C.

FOT Teams and People

1. Research Institute contracted to run FOT
2. Project Manager
3. Research Team
4. Technical Support Team
5. Administrative Support Team
6. Project Steering Committee
7. Project Management Team
8. Accounting/Auditing Advisor
9. Legal and Ethical Advisors
10. Sub-Contractors
11. Public Relations and Communications advisor
12. Project Sponsor(s)

Activity 1: Convene FOT teams and people		
Tasks and Sub-Tasks	Person / Team / Organisation Responsible for Activity	Done
1.1 Appoint FOT project manager	Research Institute contracted to run FOT	☐
1.2 Appoint research team	Project Manager,	☐
1.3 Appoint technical support team	Project Manager, Project Steering Committee	☐
1.4 Appoint administrative support team	Project Manager	☐
1.5 Appoint team leaders in each of the research, technical and administrative teams	Project Manager	☐
1.6 Appoint project steering committee	Project Manager, Project Steering Committee, Project Management Team, Public Relations and Communications advisor, Project Sponsor(s)	☐
1.7 Appoint project management team (for –day-to-day management)	Project Manager	☐
1.8 Appoint accounting / auditing advisor	Project Manager, Project Management Team	☐
1.9 Appoint a legal and ethics advisor.	Project Manager, Project Management Team	☐

1.10 Appoint sub-contractors	Project Manager, Project Management Team	☐
1.11 Appoint a public relations/communications advisor	Project Manager, Project Management Team	☐
1.12 Sign off on agreed research and support structure.	Project Manager, Project Management Team, Administrative Support Team Accounting/Auditing Advisor, Project Sponsor(s)	☐

Critical Considerations (the "dos" and "don'ts")[1]

- ✓ While the project manager must have knowledge of all activities, ensure that critical knowledge is not vested in just one person. Personnel, including the project manager, may leave the project. *Ensure that there is "standby" for all key research and management roles within the FOT.*
- ✓ Appoint early someone to deal with human participants/ethics committee issues.
- ✓ Include in the research team someone who is a "gizmo" expert – who has up to date knowledge about current ICT/ITS developments and capabilities. Civil engineering and geographical information system (GIS) expertise is also critical.
- ✓ Ensure the project management team meets regularly (about once a month) to resolve research issues, monitor timelines and budgets, and resolve administrative, technical and other issues.
- ✓ *Choose contractors that can guarantee that, if a staff member leaves or is ill, there is sufficient expertise and capacity to maintain project continuity.*
- ✓ Maintain good relations with other partners involved in the FOT.
- ✓ *Ensure that the FOT evaluation process will be, and be recognised as, independent.*
- ✓ It is not necessary to appoint all teams/people at the same time – appointments should coincide with project needs.
- ✓ Identify a final internal arbiter, acceptable to all parties, who can resolve scientific, administrative, legal and other disputes.
- ✓ Decide early in the project the frequency and timing of project Steering Committee meetings

General Advice[10]

- ✓ Although this Activity precedes Activity 2, the choice of teams and people will be determined to some extent by the aims and objectives of the FOT.

[1] Italic is used to emphasise the most important items

- ✓ Appoint a project manager with excellent research, project management and communication skills. (Note. In some FOTs, the FOT project manager is responsible for both the administrative and scientific management of the FOT. In other FOTs, a senior researcher may be responsible for the scientific, but not the administrative, management of the FOT. This requirement will depend on the scale of the FOT.)
- ✓ The research team should be multi-disciplinary and would typically include psychologists, civil, mechanical, electrical and electronics engineers, statisticians, human factors experts, traffic safety experts, and socio-economic modelling experts.
- ✓ The technical support team would normally include computer software engineers, communications engineers, mechanical, traffic, civil and electronic engineers, and GIS experts.
- ✓ The project Steering Committee sets the strategic direction of the project and keeps it aligned with the project aims and objectives. Normally it would include the FOT project manager, selected members of the research and project management teams (e. g., the team leaders), along with key stakeholders and the sponsor(s). Members should have authority to commit their organizations to the aims, objectives and implementation of the FOT. For smaller FOT projects, the stakeholder committee may not be necessary.
- ✓ The project management team is led by the FOT project manager and includes selected members of the research (e. g, the team leaders), technical and administrative teams.
- ✓ A legal advisor should support the FOT over the full duration of the project (a lawyers office providing advice whenever needed is sufficient). Legal knowledge must be available on the legal situation in the country in which the FOT is conducted.

Activity 2:

Define aims, objectives, research questions and hypotheses

Tasks and Sub-Tasks	Person/ Team/ Organisation Responsible for Activity	Done
2.1 Define aims and objectives of FOT, in conjunction with relevant stakeholders	Project Manager, Research Team, Technical Support Team, Project Steering Committee	☐
2.2 Identify systems and functions to be tested	Project Manager, Research Team, Technical Support Team, Project Steering Committee	☐
2.3 Identify use cases/ situations in which systems and functions are to be tested	Project Manager, Research Team, Technical Support Team Project Steering Committee	☐
2.4 Define research questions and prioritise them	Project Manager, Research Team, Technical Support Team Project Steering Committee	☐

2.5 Formulate hypotheses to be tested, deriving from research questions	Project Manager, Research Team, Technical Support Team Project Steering Committee	☐
2.6 Determine constraints which may prevent the aims and objectives from being met	Project Manager, Research Team, Technical Support Team Project Steering Committee Project Management Team	☐
2.7 Define final aims and objectives of the FOT, and seek agreement from relevant stakeholders.	Project Manager, Research Team, Technical Support Team, Project Steering Committee	☐
2.8 Sign off on aims and objectives of FOT	Project Manager, Research Team, Technical Support Team, Project Steering Committee, Project Management Team, Public Relations and Communications advisor, Project Sponsor(s)	☐

Critical Considerations (the "dos" and "don'ts")

- ✓ Be prepared for the potential for FOT aims and objectives to change when new administrations come in.
- ✓ Be prepared for the potential for conflict in objectives by different stakeholders. e. g., a car manufacturer wants a deep understanding of product use and driver behaviour and acceptance while public authorities are more interested in determining the impact of system use on traffic and on the transport system.

General Advice

- ✓ See the FESTA Handbook for further advice on defining the aims, objectives, research questions and hypotheses for a FOT.
- ✓ Constraints which may prevent the aims and objectives from being met might include cost, lack of supporting infrastructure, time, willingness and commitment of key stakeholders to cooperate in providing supporting infrastructure, their likely support in promoting the aims and objectives of the FOT, the availability of appropriate data, etc
- ✓ Commonly cited aims are:
  - evaluate system(s) effectiveness in changing behaviour and performance
  - evaluate driver acceptance of system(s), including willingness to purchase
  -evaluate system technical operation
  - stimulate societal demand for new technologies
  - evaluate safety impacts
  - evaluate environmental impacts

- evaluate impacts on traffic (e. g., congestion, mobility)
- evaluate socio-economic cost-benefits
- evaluate commercial impacts (e. g., productivity, return on investment, direct cost savings, incremental revenues by getting more customers, customer loyalty, etc.)

✓ *Defining the research questions and prioritizing them at an early stage will ensure they stay at the focus of the FOT and help protect from subsequent "mission creep"*

Activity 3:

Develop FOT project management plan

Tasks and Sub-Tasks	Person / Team / Organisation Responsible for Activity	Done
3.1 Define project activities, tasks and sub-tasks	Project Manager, Project Management Team	☐
3.2 Decide who is accountable for completion of activities, tasks and sub-tasks	Project Manager, Project Management Team	☐
3.3 Determine timelines for completion of activities, tasks and sub-tasks	Project Manager, Project Management Team	☐
3.4 Determine budget for project activities, tasks and timelines	Project Manager, Project Management Team	☐
3.5 Develop a project GANTT chart to guide project management	Project Manager, Project Management Team	☐
3.6 Implement procedures for monitoring project activities, timelines, budgets and resources (e. g., project management team meetings)	Project Manager, Project Management Team	☐

3.7 Undertake a risk assessment for the FOT and plan contingencies as required.	Project Manager, Project Management Team, Risk Management Consultant	☐
3.8 Determine sign off procedures (meetings and documents) to ensure that there is sign off on all critical decisions and stages in the FOT by all relevant parties	Project Manager, Project Management Team	☐
3.9 Agree on project issues which are confidential and implement mechanisms for safeguarding their confidentiality.	Project Manager, Project Management Team, Project Sponsor(s)	☐
3.10 Develop a manual for conducting the FOT that documents critical procedural knowledge.	Project Manager, Research Team, Technical Support Team	☐
3.11 Sign off on project management plan.	Project Manager, Project Management Team, Project Sponsor(s)	☐

Critical Considerations (the "dos" and "don'ts")

- ✓ *Include in the total budget some "contingency" that can be used to pay for unforeseen activities and tasks (especially meetings) that cannot be anticipated.* 5 -10 percent of the total project cost is recommended. Different elements of the project may require different proportions of this contingency. It should be held and allocated by the project manager, not sub-activity leaders or partners.
- ✓ Identify and document in the GANTT chart the dependencies that exist between different activities, tasks and sub-tasks.
- ✓ Anticipate the need and budget for specialist consultants with skills and expertise that does not exist within the project team (e. g., training experts, software developers, lawyers etc)
- ✓ Where relevant, anticipate changes to 3rd party vehicle fleets (e. g. vehicle upgrades and changes in operating routes) during the course of the FOT.
- ✓ Be aware that technical efforts are most likely to incur risk in terms of time and budget (especially the hardening up/refinement of systems, where these are developed within the FOT)
- ✓ *Don't under-estimate the time required and the cost of designing, running, analysing and de-commissioning the FOT. It will be greater than you think.*
- ✓ Assume that some further modifications to, and fine tuning of, the project management plan will be required. It is impossible to foresee

everything that is required in running a FOT.

- ✓ Develop procedural manuals for those conducting the FOT to ensure that, if staff leave, all procedural knowledge does not leave with them. These should be developed for each activity.

General Advice

- ✓ *Documentation of all project meetings is critical to record critical decisions, document the lessons learnt and justify possible blowouts in budgets and timelines.*
- ✓ A budgeting structure that accommodates the uncertainties associated with running FOTs is desirable – for example, a series of prospective budgets for each critical stage of the FOT.
- ✓ *Be aware that in some jurisdictions project papers from publicly funded projects are public documents and copies can be requested by members of the public.*

Activity 4:

Implement procedures and protocols for communicating with stakeholders

Tasks and Sub-Tasks	Person / Team / Organisation Responsible for Activity	Done
4.1 Commission communications advisor to design communications plan	Project Manager, Project Management Team	☐
4.2 Develop and implement communications plan	Project Manager, Project Management Team, Public Relations and Communications advisor	☐
4.3 Appoint media spokes people	Project Manager, Project Management Team, Project Steering Committee	☐
4.4 Sign off on agreed communication protocols.	Project Manager, Project Management Team, Public Relations and Communications advisor, Project Sponsor(s)	☐

Critical Considerations (the "dos" and "don'ts")

- ✓ *Assume that you will be mis-represented by the media. Try and limit media attention until the data collection is complete.*
- ✓ *Agree in the contract with the sponsor who is responsible for press releases and dissemination of information and results.*

- ✓ *FOTs attract a lot of media attention. Provide adequate time and budget for unsolicited communication with stakeholders, especially with the media.*
- ✓ Ensure that the project steering committee has input to the communications plan.
- ✓ *Ensure that there is appropriate control of communication with the media, through the appointed media spokesperson. For EU projects, involving multiple partners, it may be necessary to appoint more than one media spokesperson.*
- ✓ Everyone involved in the project must know who the media spokesperson is.
- ✓ *The media spokesperson should consult with the project management group before speaking to the media, especially on sensitive issues.*
- ✓ Provide media training for appointed spokespeople.
- ✓ *Build political support for the FOT early in the project, and maintain it during and after the FOT.*
- ✓ *Be aware that there may be some key stakeholders who believe that FOTs are an impediment to system rollout. These people, in particular, must be made aware of the rationale for FOTs.*
- ✓ Plan to have some results available at early stages of the project. If desirable, they should be released to an informed audience (e. g., at a conference) but not to the media as they could contaminate subsequent data collection
- ✓ Plan for annual public meetings, and a project website, to disseminate information and findings.
- ✓ *Don't undermine the scientific integrity of the research program by mis-timing communications with the media and other stakeholders*
- ✓ *Have a response prepared in case of serious incidents – such as a crash involving a test vehicle. Anticipate media contact between the media and participant drivers.*
- ✓ Be aware that fleet/truck drivers may be more inclined to disclose opinions to the media if asked.

General Advice

- ✓ *Open communication with key stakeholders is important at an early stage of the FOT to ensure that the aims and objectives of the FOT are clear, that stakeholders are committed to the project, and that the aims and objectives of the FOT are not misquoted, misrepresented or misunderstood.*
- ✓ There should be an agreed minimum level of transparency and result sharing in the FOT — avoid "confidential FOTs".
- ✓ It may be beneficial to engage a professional press office to handle external communications, particularly with the media.
- ✓ FOT drivers and FOT researchers are usually of most interest to the media.
- ✓ Decide in advance with stakeholders a minimum time for approval for statements released to the media.
- ✓ Be prepared for the possibility that politicians may at times want to veto communications between the FOT project team, the media and other stakeholders.
- ✓ Building political support outside the project can help provide protection against strong partners/sponsors
- ✓ *Early negative media attention may have a significant impact on participant recruitment and/or colour participant expectations of system performance. Try to prevent any media awareness until after the recruitment phase is complete*.

Activity 5: *Design the Study*		
Tasks and Sub-Tasks	Person / Team / Organisation Responsible for Activity	Done
5.1 Become familiar with the methods, measures and procedures of previous FOTs: o Read the FESTA handbook o Attend the FOTNET seminar and similar events and networking activities o Talk to experts who have conducted FOTs previously. o Review the relevant literature	Project Manager, Project Manager, Project Manager, Technical Support Team	☐
5.2 Identify the performance indicators necessary to test the hypotheses derived in Activity 1	Project Manager, Research Team, Technical Support Team	☐
5.3 Select measures (objective and subjective) that allow performance indicators to be derived to test the hypotheses	Project Manager, Research Team, Technical Support Team	☐
5.4 Identify the sensors and sensor requirements for obtaining the required measures	Project Manager, Research Team, Technical Support Team	☐
5.5 Design the experimental methods, tools and procedures for testing the hypotheses	Project Manager, Research Team, Technical Support Team	☐
5.6 Define methods, tools, requirements and procedures for acquiring, storing, transferring, de-coding, reducing / transcribing, filtering, backing up and verifying the data	Project Manager, Research Team, Technical Support Team	☐
5.7 Define methods, tools and procedures for analyzing the data	Project Manager, Research Team, Technical Support Team	☐
5.8 Determine optimal sample size (conduct power analyses)	Project Manager, Research Team	☐

to ensure sufficient statistical power.		
5.9 Select models for estimating the potential safety, environmental and other benefits of the technologies tested.	Project Manager, Research Team	☐
5.10 Sign off on study design, methods and tools, questionnaires and associated procedures.	Project Manager, Project Management Team, Project Steering Committee, Legal and Ethical Advisors, Project Sponsor(s)	☐

Critical Considerations (the "dos" and "don'ts")

- ✓ *Ensure that necessary historic data (e. g., data on vehicle speeds on certain roads) is available for baseline comparisons or Cost Benefit Analysis.*
- ✓ Where relevant, allow sufficient time between vehicle allocations for system maintenance and verification, servicing and repairs to be undertaken.
- ✓ Accept that it is impossible to design a perfect FOT. Many practical issues – including time and money — will constrain the final experimental design.
- ✓ Remember that an FOT is not an experiment – control is limited, and counterbalancing may not be possible.
- ✓ *Design into the FOT a contingency plan, in case there is an unexpected requirement to reduce or increase the scope of the study (e. g, to save money or time).*
- ✓ Employ a multidisciplinary team in developing hypotheses that includes researchers and people with expert knowledge about the systems to be tested.
- ✓ *Design the study in a way that allows for direct comparisons to be made between objective data (logged by the platform) and participative data (collected through questionnaires, focus groups etc).*
- ✓ Keep to an acceptable minimum the number and size of questionnaires that must be completed by participants at different points of the study, to maximise the likelihood of them being completed. A sub 2-hour completion duration is a useful target, as longer sessions may tend to remind participants that they are part of a scientific study.
- ✓ *Don't be tempted to reduce the sample size in order to save money – conducting a study with too few participants leads to a lack of statistical power to detect effects, and may ultimately be a waste of time and money.*
- ✓ Make sure that everyone understands the FOT study design, so that they appreciate the timing issues and the consequences of wanting to make changes to it e. g., if wanting to reduce the scope of the study.
- ✓ Delays in one area of the program cannot necessarily be made up by making sacrifices to other areas.
- ✓ *Don't assume that FOT users are the only ones who will use the FOT platforms.*
- ✓ Don't be pressured into changing the design of the study if, in doing so, it compromises the scientific integrity of the study.
- ✓ Ensure that all terms and phrases making up the research questions and hypotheses are clearly defined and unambiguous. This will facilitate interpretation of the FOT outcomes and comparisons with previous and future FOTS.
- ✓ *When performing the sample size calculations, allow for participant attrition, e. g. if using fleet drivers, some may leave the company during the FOT period.*

- ✓ Where hypotheses are not supported, consider conducting a process evaluation. This can help determine whether the system did not work, or whether any implementation issues may have impacted on the results. Plan for annual public meetings, and a project website, to disseminate information and findings.

General Advice

- ✓ See FESTA Handbook for detailed advice on designing the research study.
- ✓ See the FESTA Handbook reference list for published reports on previous FOTs.
- ✓ Where it is not possible, for ethical, practical or safety reasons, to investigate an issue in a FOT, consider safe alternative means for doing the research (e. g., simulators, test tracks).
- ✓ *The level of driver familiarity with the test vehicle may influence driver performance during the early stages of the FOT.*
- ✓ Ethical incentives that can be given to discourage driver attrition from the study should be agreed on early in the project.
- ✓ The models for estimating safety and other benefits may need to be updated in response to recent literature when making the estimation.
- ✓ *For the business sector, the commercial impact of the technologies deployed (e. g., in terms of productivity, return on investment, cost savings, incremental revenues by getting more customers, customer loyalty, etc) will be important to evaluate.*

Activity 6:

Identify and resolve FOT legal and ethical issues

Tasks and Sub-Tasks	Person / Team / Organisation Responsible for Activity	Done
6.1 Seek specialist advice to identify relevant legal and ethical issues	Project Manager, Accounting/Auditing Advisor, Legal and Ethical Advisors	☐
6.2 Resolve all legal and ethical issues that can be identified in advance	Project Manager, Project Management Team, Accounting/Auditing Advisor, Legal and Ethical Advisors	☐
6.3 Create contracts and/or agreements with all relevant parties (e. g., vehicle leasing organisations, suppliers, road operators, traffic centres, consultants, fleet managers, researchers etc) for all relevant issues (e. g., data collection, provision and usage, theft, insurance, privacy, duty of care, property, disposal of vehicles after the study, etc)	Project Manager, Project Management Team, Accounting/Auditing Advisor, Legal and Ethical Advisors	☐
6.4 Seek ethics approval to conduct study (where required) from relevant ethics committee	Project Manager, Research Team, Technical Support Team, Legal and Ethical Advisors	☐

6.5 Seek expert advice regarding liability issues and to ensure insurance provision is adequate for all foreseeable eventualities	Project Manager, Accounting/Auditing Advisor, Legal and Ethical Advisors	☐
6.6 Ensure that vehicle type approval and warranty requirements are adhered to in spite of the modifications (implementation of data logging equipment and possibly systems to be evaluated, etc.)	Project Manager, Research Team, Legal and Ethical Advisors	☐
6.7 Obtain informed consent of participants before they are allowed to participate in the FOT	Project Manager, Research Team, Technical Support Team	☐
6.8 Sign off on all aspects of the FOT design and procedures pertaining to legal and ethical matters.	Project Manager, Project Management Team, Accounting/Auditing Advisor, Legal and Ethical Advisors, Project Sponsor(s)	☐

Critical Considerations (the "dos" and "don'ts")

- ✓ *There must be mutual agreement on the relative risks to all parties before contracts are signed*.
- ✓ *Double check that the final design and conduct of the FOT accords with ethical and legal requirements in all jurisdictions in which the FOT will physically occur.*
- ✓ Ensure that all intellectual property issues are identified and resolved "up front".
- ✓ Ensure permission to drive (and necessary insurance cover) restrictions are understood by all parties, particularly participants.
- ✓ Identify the conditions under which a participant will be expelled from the study, and ensure these are made known to participants before the FOT commences.
- ✓ Ensure that all participating drivers are fully licensed to drive the test vehicles.
- ✓ *Don't forget about the need to adhere to contractual obligations and confidentiality agreements. FOTs often extend over long periods, making it easy to lose sight of obligations and agreements*.
- ✓ Clarify participant responsibilities and the study's obligations to the participants. Participant responsibilities should include routine vehicle maintenance activities e. g., checking fluid levels.
- ✓ *Ensure all relevant health and safety requirements of participants and the study team are met.*
- ✓ for anonymised data to be passed to 3rd parties. (NB with GPS and video data it may be very difficult to guarantee anonymity). All project staff must understand who has access to project data, especially video data.
- ✓ *All study team members must understand the agreed response should a major incident, such as an accident, occurs. Media comment should only be made by the spokesperson.*
- ✓ Don't underestimate the complexity and the time commitment involved in identifying and resolving the legal and ethical issues associated with

the conduct of an FOT.

- ✓ *Ensure that all methods, tools, procedures and materials used in the study that require legal and ethics approval are approved by the ethics committee at appropriate points in the study.*

General Advice

- ✓ See Deliverable D 6.3, Annexe A of the FESTA Handbook for detailed advice on legal and ethical issues.

Activity 7:

Select and obtain FOT test platforms (vehicles, mobile devices, road side units, ...)

Tasks and Sub-Tasks	Person/ Team/ Organisation Responsible for Activity	Done
7.1 Specify functional requirements, performance specifications and user requirements for the test platforms needed for the study.	Project Manager, Research Team, Technical Support Team	☐
7.2 Specify functional requirements and performance specifications for the integration into platforms of all systems needed for the FOT (FOT technologies, support technologies and data collection technologies), if these are not already in the platforms.	Project Manager, Research Team, Technical Support Team	☐
7.3 Select test platforms (makes and models) that meet above requirements.	Project Manager, Technical Support Team	☐
7.4 Where relevant purchase, lease, hire or borrow (where the driver owns the vehicle) the test vehicles and/or platforms.	Project Manager, Accounting/Auditing Advisor	☐
7.5 Sign off on selection and obtaining of test platforms.	Project Manager, Technical Support Team, Project Management Team, Project Sponsor(s)	☐

Critical Considerations (the "dos" and "don'ts")

- ✓ The choice of platforms may well impinge on the selection of participants which, in itself, will impact on the research questions. Choice of platforms must be undertaken at an early stage in the project's planning.

- ✓ Be aware of the large costs associated with leasing vehicles that are used in FOTs.
- ✓ *Consider obtaining extra test platforms. These can be used as spare items in case of failure and as "showcasing" platforms. The latter can be driven at appropriate times by politicians and other high ranking officials in positions of authority to promote and deploy the systems on a wider scale.*
- ✓ Be aware that vehicle choice may affect participant response if the test vehicle is significantly better/worse than the vehicle they are used to driving. Choose a conservative model.
- ✓ *Do consider vehicle maintenance requirements and the dealer network that is available in the FOT area. If the FOT will take place in a limited area, consider advising the local dealer(s) of the study. This may be important if a participant takes a test vehicle to a dealer to fix a problem.*

General Advice

- ✓ Where used, the test vehicle will vary, depending on the nature of the FOT. In some FOTs, the test vehicles will already contain mature OEM systems. In others, the systems will need to be developed (fully or partly) and integrated into the vehicles. In some FOTs, the systems will be integrated into drivers' own vehicles; in others, they will be integrated into company fleet vehicles.
- ✓ The test platforms must be capable of hosting the technologies to be evaluated (OEM, aftermarket and nomadic) and the data logging and support systems

Activity 8:

Select and obtain systems and functions to be evaluated during FOT (if they are not already implemented in the test platforms)

Tasks and Sub-Tasks	Person / Team / Organisation Responsible for Activity	Done
8.1 Develop selection criteria for choosing systems and functions (OEM, aftermarket and nomadic) to be tested (if the technologies to be tested have not already been selected by the sponsor; see General Advice column).	Project Manager, Research Team, Technical Support Team, Project Steering Committee	☐
8.2 Use above selection criteria to select and obtain systems to be tested	Project Manager, Research Team, Technical Support Team	☐
8.3 If commercial systems do not exist, that meet the above criteria, develop functional requirements and performance specifications for systems that do, (including for HMI and	Project Manager, Research Team, Technical Support Team and (if appropriate) consultant	☐

security issues).		
8.4 Develop functional requirements and performance specifications for the infrastructure needed to support the deployment of the technologies to be tested (e. g. digital maps, roadside units).	Project Manager, Research Team, Technical Support Team, Project Steering Committee, and (if appropriate) consultant	☐
8.5 Source infrastructure that meets the above functional requirements and specifications.	Project Manager, Technical Support Team and (if appropriate) consultant	☐
8.6 Where infrastructure is not commercially available, develop supporting infrastructure that meets the above functional requirements and performance specifications.	Project Manager, Research Team, Technical Support Team and (if appropriate) consultant	☐
8.7 If appropriate, issue Expressions of Interest/Requests for Tenders for provision of systems and supporting infrastructure.	Project Manager, Project Management Team, Accounting/Auditing Advisor, Legal and Ethical Advisors	☐
8.8 If appropriate select preferred tenderers, negotiate contracts and award contracts.	Project Manager, Project Management Team, Accounting/Auditing Advisor	☐
8.9 Decide what will be done with the test platforms, and the equipment in them, once the FOT has been completed.	Project Manager, Research Team, Technical Support Team, Administrative Support Team, Project Steering Committee, Legal and Ethical Advisors, Project Sponsor(s)	☐
8.10 Sign off on selection and obtaining of systems and functions to be evaluated during the FOT	Project Manager, Technical Support Team, Project Management Team, Project Sponsor(s)	☐
Critical Considerations (the “dos” and “don’ts”) ✓ *Do ensure that criteria for the selection of candidate systems (where this is appropriate) to be evaluated are developed in consultation with relevant stakeholders, to ensure the systems to be tested meet the needs of all relevant stakeholders and are suitable for in-car use (this includes good interface design).* ✓ Selection of systems must be undertaken with consideration of the data-logging system. If not, problems of interfacing may result. ✓ Beware of hidden costs of hardware and software development if these items are not originally designed for research purposes.		
General Advice ✓ Criteria for selection of candidate systems in the FOT (if they have not been pre-selected by the sponsor) could include: likely safety or		

environmental benefit, likely benefit in increasing commercial productivity and efficiency, availability, compatibility with host vehicles, technical performance, cost, reliability, maintainability, likely acceptability to drivers, usability, compliance with relevant human factors/ergonomic guidelines, compliance with local legal requirements, compliance with relevant standards, crashworthiness etc

- ✓ If prototype systems are tested, then estimates of durability, reliability, maintenance costs etc of production systems will be difficult, and full Cost Benefit Analyses may not be possible.

Activity 9:

Select and obtain data collection and transfer systems

Tasks and Sub-Tasks	Person / Team / Organisation Responsible for Activity	Done
9.1 Specify data to be logged (measures and sampling rate)	Project Manager, Research Team, Technical Support Team	☐
9.2 Specify functional requirements and performance specifications for systems for collecting and transferring the data to be logged.	Project Manager, Research Team, Technical Support Team	☐
9.3 Source, purchase and/or develop systems for logging and transferring the data that meet the above functional requirements and performance specifications.	Project Manager, Technical Support Team and (if appropriate) sub-contractors.	☐
9.4 Sign off on selection and obtaining of data collection and transfer system.	Project Manager, Project Management Team, Legal and Ethical Advisors, Project Sponsor(s)	☐

Critical Considerations (the "dos" and "don'ts")

- ✓ Implement re-calibration procedures that will ensure accuracy of measurements/sensors over time and help prevent data drift issues.
- ✓ Plan for software upgrade and revision during the FOT and try to ensure that all software systems are updated together. Ideally, this should be possible remotely.
- ✓ *Where used, in-vehicle data logging systems need to be unobtrusive, safe and secure — but they also need to be accessible to enable routine repairs.*
- ✓ *Where relevant, provide a local location for vehicle support and a vehicle tracking capability.*
- ✓ Minimise user involvement in data download from test platforms.
- ✓ *Ensure boot-up time for test systems and data logging systems is sufficiently fast to prevent data loss at the beginning of each trip.*
- ✓ *Ensure that a common time stamp is used for all recorded data sources.*
- ✓ Verify the definition of signals provided by 3rd parties (e.g. CAN message definitions by vehicle manufacturers)

- ✓ Do not allow data collection to proceed automatically without active confirmation of data capture and validity. This may include the generation of warning messages (SMS?) when out of tolerance data is recorded.
- ✓ Recognise that some data is much more important than others and should be given a relatively higher priority.
- ✓ *Do keep a stock of spares for critical items and anticipate that some components may become unobtainable during the study.*
- ✓ Consider the opportunities for ad-hoc and post-hoc interrogation of raw data files to answer additional questions. This may not be possible if data collection is triggered.

General Advice

- ✓ See chapters Error! Reference source not found. and Error! Reference source not found. of the FESTA Handbook for more detail.
- ✓ The technologies fitted to test vehicles may also include supplementary technologies (such as sensor technologies; e. g., forward looking radars, GPS) that are needed to, for example, measure inter-vehicle following distances in order to determine whether speeds are free or constrained (e. g., see Regan et al, 2006, Volume 1).
- ✓ See Deliverable D6.3, Annexe A and Chapter 3 on legal issues of data privacy to be aware of possible dangers and legal provisions.

Activity 10:

Select and obtain support systems for FOT platforms

Tasks and Sub-Tasks	Person / Team / Organisation Responsible for Activity	Done
10.1 Define the support systems needed (see General Advice Column)	Project Manager, Research Team, Technical Support Team and (if appropriate) consultant	☐
10.2 Develop functional requirements and performance specifications for systems needed to support the study	Project Manager, Research Team, Technical Support Team and (if appropriate) consultant	☐
10.3 Where appropriate, develop functional requirements and performance specifications for the HMI, to ensure that the HMI for support systems is safe and user-friendly	Project Manager, Research Team, Technical Support Team and (if appropriate) consultant	☐
10.4 Source, purchase and/or develop support systems that meet above functional requirements and performance specifications	Project Manager, Technical Support Team and (if appropriate) sub-contractors.	☐
10.5 Sign off on selection and obtaining of support systems for	Project Manager, Project Management Team, Project	☐

test platforms	Sponsor(s)	

Critical Considerations (the "dos" and "don'ts")

- ✓ If possible, support systems should be capable of remote operation to allow, for example, remote system reboot.
- ✓ In the case of very large naturalistic studies it may not be practicable to intervene manually. In these cases do attempt to automate as much as possible.
- ✓ Anticipate data analysis requirements before specifying data to be logged (e. g., rates and resolution)
- ✓ Ensure that missing data are clearly indicated – e. g., if the data collection system malfunctions, missing data should NOT be indicated with a zero, where zero is a valid measure (e. g., speed).
- ✓ If in doubt about the final list of measures to be logged, log more parameters if performance of the data logging system or storage capacity are not affected. Consider the opportunities for ad-hoc and post-hoc interrogation of raw data files to answer additional questions. This may not be possible if data collection is triggered.

General Advice

- ✓ Support systems have multiple purposes: e. g., to display information to users; to automatically turn systems on and off where multiple systems are being tested and exposure to each is kept constant across drivers; for manually disabling systems in the event of malfunctions (i.e., "panic buttons"); for preventing use of systems by non-participants; for diagnosing system status and faults; etc.

Activity 11:

Equip FOT test platforms with all systems

Tasks and Sub-Tasks	Person / Team / Organisation Responsible for Activity	Done
11.1 Prepare a system installation / integration manual describing standardized procedures	Project Manager, Technical Support Team and (if appropriate) sub-contractors.	☐
11.2 Equip test platforms with the FOT systems to be evaluated (if not already installed)	Project Manager, Technical Support Team and (if appropriate) sub-contractors.	☐
11.3 Equip test platforms with data collection and transfer systems	Project Manager, Technical Support Team and (if appropriate) sub-contractors.	☐
11.4 Equip platforms with FOT support systems (e. g., panic	Project Manager, Technical Support Team and (if appropriate)	☐

button, for turning systems off in a vehicle etc.)	sub-contractors.	
11.5 Sign off on system integration activities, ensuring that all systems have been installed in accordance with the system installation/integration manual	Project Manager, Project Management Team, Project Sponsor(s)	☐
Critical Considerations (the "dos" and "don'ts") ✓ Ensure that the computers running all systems (FOT, data collection and support) have sufficient computing power to avoid processing delays. ✓ *Ensure that all systems (FOT, data collection and support) operate identically across test platforms.* ✓ *Allow all new vehicles a burn-in period (around 1000km) so that vehicle faults, that could disrupt the FOT, can be detected.* ✓ Be aware that 'identical' platforms and sensors may perform differently due to variation in components, manufacturing variability and environmental conditions. Check for differences that may be critical for the FOT. ✓ Try and make all adaptations to test vehicles (e. g., fitment of novel display systems) invisible to reduce the likelihood of theft or behaviour modification by other drivers.		
General Advice ✓		
Activity 12: *Design and implement user feedback and reporting systems*		
Tasks and Sub-Tasks	Person/ Team/ Organisation Responsible for Activity	Done
12.1 Design, develop and implement systems and procedures to allow users to report technical problems in a timely manner.	Project Manager, Research Team, Technical Support Team	☐
12.2 Design, develop and implement systems and procedures to allow users to provide feedback to researchers, in real time or retrospectively (e. g., usability problems, opinions of systems, confirmation that systems are operating as required etc)	Project Manager, Research Team, Technical Support Team	☐
12.3 Design, develop and implement systems and procedures that allow researchers to monitor participant progress (e. g., to	Project Manager, Research Team, Technical Support Team	☐

ensure they are adhering to study requirements).		
12.4 Sign off on implementation of user feedback and reporting systems and procedures	Project Manager, Research Team, Technical Support Team, Project Management Team, Project Sponsor(s)	☐

Critical Considerations (the "dos" and "don'ts")

- ✓ Implement 'user diaries' to allow confirmation of user identity and trip details if this process cannot be automated. This may encourage users to behave less naturally.
- ✓ Implement a timetable for the timely collection of qualitative data so that participants don't have to rely on their memories.
- ✓ *Anticipate that users may not complete diaries accurately or consistently and may fail to attend for de-briefing interviews. Appoint user liaison staff as a single point of contact.*
- ✓ *Ensure that the project team can respond to emergencies and incidents on a 24/7 basis.*
- ✓ Do ask participants to announce when they are going on holiday or not using the platform for an extended period.
- ✓ Keep a record of all reported problems, and document these in relevant reports.
- ✓ Ensure that all feedback and reporting procedures are documented in a manual for quick reference by the research and technical support team as required.
- ✓ Consider whether you need to design, develop and implement a system to allow for the collection of fuel consumption information
- ✓ Where fuel consumption is calculated manually, anticipate that drivers will not always use fuel cards, return fuel dockets or fill in the fuel logbook.

General Advice

- ✓

Activity 13:

Select, obtain and implement standard relational database for storing FOT data

Tasks and Sub-Tasks	Person / Team / Organisation Responsible for Activity	Done
13.1 Design, develop and implement a database for storing data logged from the test platforms	Project Manager, Research Team, Technical Support Team	☐
13.2 Design, develop and implement a database for storing the subjective data collected from participants (e. g., from questionnaires, from focus groups, from feedback lines etc)	Project Manager, Research Team, Technical Support Team	☐

13.3 Develop data navigation and visualization tools	Project Manager, Research Team, Technical Support Team	☐
13.4 Sign off on database for storing FOT data.	Project Manager, Research Team, Technical Support Team, Project Management Team, Legal and Ethical Advisors, Project Sponsor(s)	☐

Critical Considerations (the "dos" and "don'ts")

- ✓ Before an FOT is launched, the database architecture should be reviewed by a system evaluator to ensure that all requirements are fulfilled.
- ✓ *Ensure copies are made of raw data, reduced raw data and all processed data files and store these securely, separate from the primary data store.*
- ✓ Use an industry standard relational database to store the data.
- ✓ *Ensure that unauthorised access to the database is not possible. Preferably, do not give the database host an IP number.*
- ✓ Careful database design can reduce the need for post-collection manipulation if the database is designed to feed directly into a statistical package for data cleaning and analysis.
- ✓ *Decide early in the project how to manage post-project data. Issues to consider are: What happens to data when the project ends? Who will have data usage rights? Who can access it? Who pays for possible storage? In projects with large amounts of stored data (several terabytes), the cost to store and manage data is not insignificant, and all project partners might not have the means to handle it afterwards. Where data is taken off-line, determine what meta data should be kept, and how.*

General Advice

- ✓ See section Error! Reference source not found. and Error! Reference source not found. of the FESTA handbook for more detailed advice relating to this activity.
- ✓ Basic legal advice on this issue is also provided in Deliverable D6.3 and the Annexe A.

Activity 14:

Test all systems against functional requirements and performance specifications

Tasks and Sub-Tasks	Person / Team / Organisation Responsible for Activity	Done
14.1 Develop "acceptance testing" protocols (see comment column).	Project Manager, Research Team, Technical Support Team	☐

14.2 Test the systems for acceptance, using the acceptance testing protocol	Project Manager, Research Team, Technical Support Team	☐
14.3 Develop a usability test plan for the purpose of assessing the systems and functions for usability	Project Manager, Research Team with consultant (if appropriate)	☐
14.4 Conduct usability testing, using the usability testing plan, to ensure systems and functions are user-friendly and that they meet all usability assessment criteria	Project Manager, Research Team, with consultant (if appropriate)	☐
14.5 Obtain or develop a valid and reliable ergonomic checklist	Project Manager, Research Team	☐
14.6 Assess systems, using the ergonomic checklist, to ensure that they meet all relevant criteria.	Project Manager, Research Team	☐
14.7 Assess vehicles against relevant certification procedures to ensure that vehicles are safe, roadworthy and comply with all relevant National, State and Territory laws, treaties and other protocols.	Project Manager, Technical Support Team with consultant (if appropriate)	☐
14.8 Ensure that all vehicle modifications that affect primary safety are signed off by a competent engineer or appropriate testing authority.	Project Manager, Technical Support Team with consultant (if appropriate)	☐
14.9 Rectify all technical, usability, ergonomic and certification issues where deficiencies are noted.	Project Manager, Research Team, Technical Support Team with consultant (if appropriate)	☐
14.10 Sign off on completion of all systems tests	Project Manager, Research Team, Technical Support Team, Project Management Team, Project Sponsor(s)	☐

Critical Considerations (the “dos” and “don’ts”)

- ✓ *Do not sign off on the outputs of any of the previous activities until all technologies have been tested and, where appropriate, refined.*
- ✓ Be sure that all systems are designed so they do not drain the battery when the engine is not running.
- ✓ Be sure that retrofitted systems are properly secured and meet all relevant crashworthiness requirements.
- ✓ If sub-contractors are appointed to install or maintain test equipment, implement a quality assurance programme.
- ✓ *Be aware that system clocks can drift significantly if left to run independently . Where feasible, use GPS time to correct system clock error.*

- ✓ *Implement procedures to ensure that alignment and calibration of sensors is maintained and tested in all potential weather conditions.*
- ✓ Various guidelines, standards and checklists exist for assessing the ergonomic quality of the human-machine interface for ICT systems (see Regan, Lee and Young, 2008, for a summary). Also see: AIDE (EU-Project) Deliverable 4.3.1: "Report on the review of available guidelines and standards" – publicly available over the internet.
- ✓ *Be aware that some system components may become corrupted over time with continuous use (e. g. flash memory cards).*
- ✓ Revisit the installation manual for all platforms.
- ✓ Consider the need to obtain waivers/special licences from regulatory authorities for equipment that is non-compliant (e. g. radars that operate outside legal bandwidths).
- ✓ Standard testing of vehicle modifications by a competent authority may be necessary with respect to safety features (e. g. proper deployment of airbags following modification to vehicle interiors).
- ✓ *Be aware that some systems (e. g. displays) that are not OEM-installed may fail in automotive environments.*
- ✓ *Where appropriate, test for radio frequency (RF) interference effects (e. g. from overhead tram wires), which may adversely affect system operation. Also ensure that normal vehicle systems (e. g. FM radio and remote locking) are not affected by installed equipment.*
- ✓ Ensure that the computers powering the data collection system and support systems are powerful enough to ensure that the data sampling rate is consistent and at the rate specified.
- ✓ Don't assume that OEM systems that are already installed in test vehicles have been ergonomically assessed against appropriate standards and guidelines. Ergonomic assessment of systems prior to system deployment can be useful in identifying ergonomic problems that may explain or confound treatment effects.
- ✓ Provide a written statement for the participants to keep (in the vehicle) which confirms their participation in the FOT and the nature of vehicle modifications – in case they are challenged by Police or other authorities.
- ✓ *Resolving any technical, usability, ergonomic, and certification issues may require several iterations. Do not underestimate the time required for this process.*

General Advice

- ✓ This activity is *not* about pilot testing — it is about testing the performance, security and reliability of systems – to ensure that all technologies to be deployed perform in accordance with the functional requirements and performance specifications developed for them in previous activities.
- ✓ An Acceptance testing Protocol is a test protocol for testing that all systems to be used in the study (FOT systems, data collection systems and support systems) meet the functional requirements and performance specifications developed for them by the FOT project team, under all foreseeable operating conditions.
- ✓ The term "usability" can mean different things to different people. The test plan should use a standard definition of usability (e. g. ISO 9241).
- ✓ Be aware that the frequency used by some radar-based systems may interfere with the operation of other systems used by Police, emergency services or other operators (or vice versa) when used in other countries or jurisdictions. This must be investigated where the FOT is conducted across State and international boundaries.

Activity 15:

Develop FOT recruitment strategy and materials

Tasks and Sub-Tasks	Person / Team / Organisation Responsible for Activity	Done
15.1 Develop recruitment strategy, including user entry and exit requirements and procedures.	Project Manager, Research Team, Legal and Ethical Advisors	☐
15.2 Develop recruitment materials and procedures	Project Manager, Research Team, Public Relations and Communications advisor	☐
15.3 Sign off on recruitment strategy, materials and procedures.	Project Manager, Research Team, Project Management Team	☐

Critical Considerations (the "dos" and "don'ts")

- ✓ Consider whether participants should be representative of the relevant population to ensure generalisability of results.
- ✓ Assume that there will be an attrition rate of about 10 to 15 % when using company employees, who come and go, and retire.
- ✓ Be aware that, when company employees change jobs within their companies, this may have a dramatic effect on their annual travel.
- ✓ If fleet drivers are recruited via a fleet owner or manager it is also necessary to get buy-in from individual drivers.
- ✓ With respect to safety, select drivers who do not pose a risk to themselves, others or the project. Be aware of the potential for bias in the results.
- ✓ Do not underestimate the complexities involved in recruiting company employees.
- ✓ Be aware that some commercial operations may have employee turn-over rates approaching 100 % per annum.

General Advice

- ✓ See chapters Error! Reference source not found. and Error! Reference source not found. for further advice relevant to this Activity.
- ✓ *The Ethical requirements for recruitment of users may be difficult to adhere to when recruiting company employees.*
- ✓ Ideal companies to approach to recruit fleet vehicle drivers have the following characteristics: many vehicles; drivers have high mileage rates; drivers drive primarily in the geographical areas of interest in the FOT; and management has a commitment to the aims and objectives of the FOT.
- ✓ It is not possible in many countries to obtain personal information about drivers that can be used to screen them for inclusion in the study (e. g., has a drunk driving record).
- ✓ It may not be possible in some countries to obtain directly from car dealers the names of drivers of particular makes and models of vehicles.
- ✓ In some countries (e. g., France), potential participants must be screened by a registered doctor.
- ✓ *The recruitment materials and procedures will need to have been incorporated and approved as part of the FOT ethics and legal approval processes.*

Activity 16: *Develop training and briefing materials*		
Tasks and Sub-Tasks	Person/ Team/ Organisation Responsible for Activity	Done
16.1 Conduct training needs analysis (TNA) to identify training requirements of participants and other relevant actors	Project Manager, Research Team with consultant (if appropriate)	☐
16.2 Design and develop briefing and training materials, based on outputs of the TNA	Project Manager, Research Team with consultant (if appropriate)	☐
16.3 Design and develop FOT system(s) user manual (if appropriate)	Project Manager, Research Team, Legal and Ethical Advisors	☐
16.4 Design and document the procedures for the delivery of the briefing and training to the FOT participants	Project Manager, Research Team	☐
16.5 Sign off on training and driver (and company) briefing materials and delivery processes.	Project Manager, Research Team, Project Management Team	☐

Critical Considerations (the "dos" and "don'ts")

- ✓ *Ensure that training programs and briefing materials are designed in a way that does not confound experimental treatment effects.*
- ✓ Ensure all users understand existing all systems and functions to be used (including test systems).
- ✓ Don't underestimate the time required for the development of briefing and training materials — it is a time consuming activity.
- ✓ When pre-testing the user-friendliness of a function a self-learning approach may be used.
- ✓ Be aware that an excess of training might affect the possibility to understand the short-term unintended effects of the system.
- ✓ Provide drivers with a mini-operating manual to keep in the vehicle and prepare written materials (brochures, DVDs & CDs) that can be taken away after briefing sessions.

General Advice

- ✓ See chaptersError! Reference source not found. and Error! Reference source not found. for further advice relevant to this Activity
- ✓ See Regan et al, 2006 (Volume 2) for examples of training and briefing materials used in a previous FOT.
- ✓ *Refresher training may be required if FOT systems are not activated for several weeks or months into the FOT.*
- ✓ The training and briefing materials and procedures will need to have been incorporated and approved as part of the FOT ethics and legal

approval processes.		
Activity 17: *Pilot test FOT equipment, methods and procedures*		
Tasks and Sub-Tasks	Person / Team / Organisation Responsible for Activity	Done
17.1 Develop protocol for pilot testing FOT equipment, methods, procedures and materials (including training, briefing materials and data collection, downloading and analysis procedures)	Project Manager, Research Team, Technical Support Team, Legal and Ethical Advisors	☐
17.2 Recruit, brief and train pilot participants	Project Manager, Research Team	☐
17.3 Deploy a small sample of FOT platforms under a representative range of external conditions that will be experienced in the FOT, as per the pilot testing protocol.	Project Manager, Research Team, Technical Support Team	☐
17.4 Fine tune FOT platforms and technologies, systems, procedures and protocols, as required, on the basis of the pilot data yielded.	Project Manager, Research Team, Technical Support Team, Project Management Team	☐
17.5 Sign off on pilot testing.	Project Manager, Research Team, Technical Support Team, Project Management Team	☐
Critical Considerations (the "dos" and "don'ts") ✓ *Do not truncate your pilot test plan, and do not underestimate the time required for comprehensive pilot testing. The importance of pilot testing cannot be overstated.* ✓ Undertake a 'full dress rehearsal' with participant involvement and a duration that is representative of the duration that will occur in the FOT. ✓ Use pilot testing also as a means of estimating the amount of time required to complete activities, as this will enable more accurate budgeting during the remainder of the project. ✓ Pre-test all data analysis procedures to ensure appropriate data is collected – particularly data related to event recording triggers. ✓ Ensure that the routes used in pilot studies maximise the likelihood of critical situations of relevance to the FOT. Consider using a test track to verify the logging of critical situations.		

- ✓ Add independent monitoring systems to pilot platforms to ensure the validity of data derived from sensors.
- ✓ *In the pilot phase listen to the users and, when involved, owners and managers of the vehicle fleet – their ideas are likely to be different.*

General Advice

- ✓ See chapter Error! Reference source not found., Error! Reference source not found. and Error! Reference source not found. for further advice relevant to this Activity.
- ✓ For data collection systems, ensure that data is being recorded, determine the accuracy of data recorded, test downloading procedures and equipment, test reader software and analyse samples of pilot data.

Activity 18:

Run the FOT

Tasks and Sub-Tasks	Person / Team / Organisation Responsible for Activity	Done
18.1 Ensure that all sign offs have occurred for previous activities.	Project Manager, Project Management Team	☐
18.2 Manage the FOT: • monitor project activities, timelines, budgets and resources • prepare regular progress and financial reports for sponsor • convene and attend regular meetings with research and support teams • maintain communication with sponsor and key stakeholders	Project Manager, Research Team, Technical Support Team, Administrative Support Team, Project Management Team	☐
18.3 Recruit participants	Project Manager, Research Team	☐
18.4 Organise training session times / materials	Project Manager, Research Team	☐
18.5 Brief and train participants	Project Manager, Research Team	☐
18.6 Brief fleet managers (if appropriate)	Project Manager, Research Team	☐

18.7 Deploy FOT platforms	Project Manager, Research Team, Technical Support Team	☐
18.8 Regularly monitor participant progress, including kilometres travelled	Project Manager, Research Team	☐
18.9 Administer questionnaires and implement other data collection methods at pre-determined intervals	Project Manager, Research Team	☐
18.10 Collect, enter into database (unless automated) and store subjective data	Project Manager, Research Team	☐
18.11 Record, download and store objective (i.e., logged) data	Project Manager, Research Team, Technical Support Team	☐
18.12 Collect special data (e. g., fuel dockets) needed to analyse surrogate performance indicators	Project Manager, Research Team	☐
18.13 Monitor for, collect and document data on technical problems and user feedback	Project Manager, Research Team, Technical Support Team	☐
18.14 Commence preliminary evaluation of data, to identify instances of dangerous driving and any other findings of interest/relevance to FOT outcomes	Project Manager, Research Team, Technical Support Team	☐
18.15 Repair and re-deploy platforms (as required)	Project Manager, Technical Support Team	☐
18.16 Routinely ensure all platforms are properly maintained and legal in other ways (e. g., registered, licensed, tyres properly inflated)	Project Manager, Research Team, Technical Support Team	☐
18.17 Report dangerous driving behaviours (if legally required)	Project Manager, Research Team, Technical Support Team	☐
18.18 Conduct exit interviews with users and the other relevant actors	Project Manager, Research Team	☐
18.19 Remove systems and equipment from private vehicles (if used)	Project Manager, Technical Support Team	☐
18.20 Sign off on completion of this activity of the FOT.	Project Manager, Research Team, Technical Support Team, Administrative Support Team, Project Steering Committee,	☐

	Project Management Team, Accounting/Auditing Advisor, Sub-Contractors	

Critical Considerations (the "dos" and "don'ts")

- ✓ Anticipate, and plan for, participant 'dropout' throughout the FOT — over-sample. It is rarely possible to replace participants who drop out after more than a few days without affecting the timing plan.
- ✓ *Develop protocols for responding to drivers with technical and other problems (e. g., provide drivers with a dedicated cell phone to report problems; ensure at least two people have pagers to receive problem calls; etc) Timely responses will keep drivers happy.*
- ✓ Anticipate problems that may increase the drop out rate (e. g., higher fuel consumption in the FOT vehicle than in the drivers' own vehicle) and take steps to prevent or mitigate these problems.
- ✓ Monitor closely system usage for drivers who may be tempted to 'demonstrate' novel systems to friends and neighbours.
- ✓ Adhere to quality control mechanisms to ensure that data is being properly recorded and downloaded.
- ✓ Adhere to calibration procedures to ensure accuracy of measurements/sensors over time and help prevent data drift issues.
- ✓ Find a suitable location for training drivers where you can also assess transfer of training to the test vehicles in a safe environment
- ✓ *If the number of kilometres driven by drivers is being controlled for, conduct regular calibration checks of cumulative distance travelled.*
- ✓ Assume that it will take you 50 % longer than you think to recruit participants if recruiting company drivers.
- ✓ Check logged data as soon as you receive it to verify accuracy and completeness of data and verify kilometres travelled.
- ✓ *Monitor and record critical factors that could have an impact on the measured outcomes/dependent variables (e. g., changes in Police enforcement strategies, unseasonal weather conditions). If these are not controlled for in the experimental design, or accounted for in the analyses, they could confound the measured effects of the systems being tested.*
- ✓ Where company fleet vehicles are involved in the study, advise fleet managers not to "demonstrate" their vehicles, as this may compromise the aims of the study.
- ✓ *Give sponsors early warning of potential problems that could compromise the integrity of the study, or increase the budget.*
- ✓ Encourage participants to report technical problems as soon as possible.
- ✓ *Don't assume that all systems in the test vehicles are functioning as required. Develop systems to check, at appropriate times, that they are operating properly.*
- ✓ Don't assume that drivers will do what you ask them to do (e. g., to fill out questionnaires; maintain vehicles). They need regular reminding and follow-up.
- ✓ Where data downloading is manual, don't forget to replace flash memory cards, or other storage devices, with new (empty) ones on a regular basis.
- ✓ Do not always assume that drivers will clock up their kilometres evenly over the trial. Contact them on a regular basis to check cumulative distance logged.
- ✓ If legally required, don't forget to report to the appropriate authorities (e. g., company fleet managers) recorded instances of dangerous driving by test drivers.
- ✓ *Don't assume that drivers will drive the vehicles without trailers, bike racks and other accessories. These may affect the operation of some FOT systems (e. g., reverse collision warning devices).*
- ✓ Minimise interference to commercial operations during FOTS, especially trucking operations. Problems that compromise commercial productivity

may result in companies withdrawing trucks from the FOT.

- ✓ *Make sure fleet managers are, and remain, motivated. Their support is critical.*
- ✓ Be careful about the feedback given to drivers. They may be concerned about the possibilities of 'unintended consequences' e. g., their managers learning how and when they take rest breaks etc.
- ✓ Participants are more likely to comply with what is asked of them if they engage with the project. Ongoing communication and even small incentives can enhance perceived engagement and improve compliance. However, the level of engagement must not compromise the outcomes of the study.
- ✓ Remember that long-term involvement in a research study can be onerous for a participant. At all times treat them as participants in the study process, not simply subjects of a study.
- ✓ *Allow sufficient time for any data entry which has to be done manually (e. g., responses from pencil and paper questionnaires, focus groups). As far as is possible, manual data entry should be carried out routinely during the course of the data collection phase and not all left to the end.*
- ✓ A system for basic inventory management is recommended for FOTs with more than a few vehicles in use. For such a system to be efficient, sensors, data acquisition system units, vehicles and all other equipment need to be included, as well as relevant supporting procedures developed.

General Advice

- ✓ More detailed advice can be found in other chapters of this Handbook: Chapter Error! Reference source not found. for participant recruitment); Chapters Error! Reference source not found. and Chapter Error! Reference source not found. for organising training sessions; Chapters Error! Reference source not found., Error! Reference source not found. for implementing data collection methods at pre-determined intervals and for collecting and storing subjective data; Error! Reference source not found. for preliminary data analysis; Chapter Error! Reference source not found., Error! Reference source not found. and Error! Reference source not found. for vehicle maintenance and compliance with laws; and Chapter Error! Reference source not found. for reporting of dangerous driving, where appropriate.
- ✓ *Ongoing communication with key stakeholders is important during the FOT to ensure that the aims and objectives of the FOT are clear, that stakeholders stay committed to the project, and that the aims and objectives of the FOT are not misquoted, misrepresented or misunderstood.*

Activity 19:

Analyse FOT data

Tasks and Sub-Tasks	Person / Team / Organisation Responsible for Activity	Done
19.1 Develop a data analysis plan	Project Manager, Research Team, Technical Support Team	☐
19.2 Analyse objective (i.e., logged and recorded data)	Project Manager, Research Team	☐

19.3 Analyse subjective data (i.e., data obtained from interviews, questionnaires, focus groups, hotlines, etc)	Project Manager, Research Team	☐
19.4 Draw conclusions with respect to the hypotheses generated for the FOT	Project Manager, Research Team	☐
19.5 Sign off on completion of all required analyses	Project Manager, Research Team, Project Management Team, Project Sponsor(s)	☐

Critical Considerations (the "dos" and "don'ts")

- ✓ Plan for the fact that there will be constant demand for study findings, such as general trends in the data, early in the project, even though the data may not be statistically reliable enough to report with any confidence.
- ✓ In a well-powered study, null findings (i.e., where no effect is found and the hypotheses refuted) are potentially as interesting as when the hypotheses are supported.
- ✓ *Anticipate the requirement to have to perform supplementary analyses for the funding organisation, which may be expensive and not originally budgeted for. This will require negotiation with the sponsor if these analyses are expected to be carried out within the original budget.*
- ✓ Anticipate that, unless distance travelled is controlled for in the FOT, the distance travelled by different drivers will vary significantly. Take this into account in the analysis to ensure results are not skewed.
- ✓ Don't forget to run "reality checks" on the data, to be sure that the data are "clean". This is essential.
- ✓ *If data is reduced/aggregated, always keep a copy of un-aggregated data.*
- ✓ Ensure that all data analysts have used the test vehicles and understand the circumstances in which data was/is collected.
- ✓ All team members who handle participant data should receive appropriate training regarding data privacy.
- ✓ Work out how to best filter logged data and deal with missing data.

General Advice

- ✓ See Chapters Error! Reference source not found., Error! Reference source not found. and Error! Reference source not found. for detailed advice on data analysis tools and methods.
- ✓ There may be a requirement to conduct ongoing analysis, such as ongoing identification of dangerous drivers, determining whether adaptation to systems is occurring early enough to warrant a shorter FOT duration (e. g., to save money and time), and to identify early trends in the data. These checks should be built into the analysis plan at the start of the project.
- ✓ Some FOTs have developed novel ways of turning ADAS technologies on and off to control precisely the amount of exposure to the technologies that are being evaluated (see Ref 1).
- ✓ Sponsors need to be calibrated about the relative costs of running FOTs. For example, the cost of running simulation models at the end of the FOT to estimate safety and other benefits of ICT technologies is a fraction of the cost of preparing and deploying the FOT vehicles.

Activity 20: *Write minutes and reports*		
Tasks and Sub-Tasks	Person / Team / Organisation Responsible for Activity	Done
20.1 Write minutes of regular project management team meetings	Project Manager	☐
20.2 Write regular minutes of Project Steering Committee meetings	Project Manager	☐
20.3 Write quarterly progress reports for the sponsor(s)	Project Manager	☐
20.4 Write the draft FOT report	Project Manager, Research Team, Technical Support Team	☐
20.5 Send the draft FOT report to relevant stakeholders and peers for peer-review	Project Manager	☐
20.6 Convene 1 or 2 meetings to discuss feedback with sponsor/peers	Project Manager	☐
20.7 Incorporate feedback and write final report.	Project Manager, Research Team, Technical Support Team	☐
20.8 Deliver final report to sponsor(s)	Project Manager	☐
20.9 Sign off on completion of all required reports	Project Manager, Research Team, Technical Support Team, Project Management Team, Project Sponsor(s)	☐

Critical Considerations (the "dos" and "don'ts")

- ✓ *Use regular progress reports to document problems, solutions and lessons learned.*
- ✓ Allow sufficient time for sponsor review of draft and final reports, but not so long that the review process drags out unduly. Six to 8 weeks is recommended.
- ✓ Consider peer review of major outputs; this will improve their quality but delay their release.
- ✓ *Document all lessons learnt in the final FOT report.*
- ✓ Ensure that the final report contains practical recommendations for wider scale deployment of those systems found to be effective, and for fine-tuning of those with potential to be more effective.

- ✓ *Develop, in consultation with the Project Steering Committee, a suggested plan for implementing the recommendations deriving from the FOT. Document the implementation plan in the FOT final report.*

General Advice

- ✓ *The FOT lifecycle is long. Hence, it is advisable to write separate reports on each critical stage of the FOT, particularly the lessons learned, to ensure that nothing important that should be documented is forgotten.*
- ✓ Formal meeting minutes are a critical resource for the project in confirming departures from the project plan.

Activity 21:

Disseminate the FOT findings

Tasks and Sub-Tasks	Person / Team / Organisation Responsible for Activity	Done
21.1 Send regular project reports to the sponsor	Project Manager	☐
21.2 Disseminate preliminary and final findings at seminars, conferences and special events	Project Manager, Research Team, Technical Support Team	☐
21.3 Prepare reports on preliminary findings for the sponsor	Project Manager, Research Team, Technical Support Team	☐
21.4 Send sponsor draft and final FOT reports	Project Manager	☐
21.5 Provide other stakeholders with access to FOT final report (s) and, if allowed, raw or filtered data from the FOT	Project Manager, Research Team, Technical Support Team	☐
21.6 Showcase the vehicles at relevant events during the FOT (e. g., Smart Demos, motor shows) to promote awareness and wider deployment of systems.	Project Manager, Technical Support Team, Project Steering Committee, Project Management Team, Project Sponsor(s)	☐

Critical Considerations (the "dos" and "don'ts")

- ✓ Disseminate the findings in accordance with the previously agreed communications plan.
- ✓ *Agree on what can and cannot be disseminated and said at different points in the study.*
- ✓ Seek necessary permissions prior to divulging FOT findings to any third party.
- ✓ FOT reports are large and expensive to print. Allocate sufficient budget at the beginning of the project for printing.
- ✓ FOT reports are large and hard to read. It is desirable to produce conference papers along the way that document the outputs of the study at

different phases. Prepare a concise 1 or 2 page synopsis of the study outcomes that can be read and easily digested by politicians, chief executives and relevant others in positions of authority.
- ✓ Agree in advance who is empowered to release and comment on results.

General Advice

- ✓ Where private industry is a participant in the FOT, it may be necessary to seek permission from the manufacturer before divulging certain information deriving from the FOT. This must be established.
- ✓ Maintain at least one vehicle for demonstrations; preferably at a location that is convenient to politicians, officials and the press.
- ✓ A demonstration and briefing to an influential politician is likely to be far more effective than sending them a report.

Activity 22:

Decommission the FOT

Tasks and Sub-Tasks	Person / Team / Organisation Responsible for Activity	Done
22.1 Conduct de-briefing interviews with participants to elicit feedback on the FOT that can be used to improve future FOTs.	Project Manager, Research Team	☐
22.2 Dispose of test vehicles which are no longer needed (if vehicles are not privately owned).	Project Manager, Research Team, Technical Support Team, Administrative Support Team, Project Management Team, Accounting/Auditing Advisor, Project Sponsor(s)	☐
22.3 Retrieve installed data logging equipment (if vehicles are privately owned)	Project Manager, Research Team, Technical Support Team, Administrative Support Team, Project Management Team, Accounting/Auditing Advisor, Project Sponsor(s)	☐

Critical Considerations (the "dos" and "don'ts")

- ✓ Ensure that participants return relevant items at the end of the study (e. g., flash memory cards, i-buttons) and perform other required activities to decommission the FOT vehicles (e. g., disconnect power to support systems).
- ✓ *Keep one vehicle until all data analyses are complete.*
- ✓ Consider providing public access to FOT databases, where ethically allowed, that enables others to use the data for other research purposes after the FOT has been de-commissioned (but remember to fully explore and address anonymity issues). The data collected and stored after the FOT is de-commissioned should be regarded as "living data".
- ✓ *Don't lose momentum at the end of the FOT. Lobby stakeholders to ensure that there is commitment to implementing the recommendations of*

the FOT.
General Advice ✓ *Consider keeping one or two vehicles as showcasing vehicles after the study, to allow stakeholders in positions of authority to experience the look and feel of the vehicles.* ✓ It may be necessary to consider legal issues of decommissioning the FOT as far as the de-installation of data logging equipment is concerned (in a contract with participants). See Deliverable 6.3 and Annexe A on legal issues.