Large Scale Collaborative Project

7th Framework Programme

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Mobility Data Analysis Plan

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LIST OF ABBREVIATIONS

ABBREVIATION	DESCRIPTION
GD	Green Driving, one of the TeleFOT functions to be assessed
NAV	Navigation, one of the TeleFOT functions to be assessed
SA	Speed Alert, one of the TeleFOT functions to be assessed
SI	Speed Information, one of the TeleFOT functions to be assessed
TI	Traffic Information, one of the TeleFOT functions to be assessed

REVISION CHART AND HISTORY LOG

REV	DATE	REASON
0.1	26/08/2009	First skeleton
0.2	16/12/2009	First draft based on common SP4 outlines
0.3	19/12/2009	Second draft utilising the reporting scheme of the draft data analysis plan for safety D4.3.1
0.4	21/12/2009	Comments of PHR on 0.3 incorporated
0.5	22/12/2009	Comments of ESRI on 0.4 incorporated
0.6	03/05/2010	Comments of ICCS on 0.5 incorporated
1.0	04/11/2010	Comments by 2nd year review incorporated

EXECUTIVE SUMMARY

Sub-project 4 of TeleFOT deals with the evaluation and assessment of data collected during the various FOTs throughout the test-sites in the project. The prime aim is to ensure that appropriate and rigorous analyses can be conducted in order to identify the impacts of aftermarket and nomadic device/function use with confidence and validity.

The deliverable contains the outline mobility assessment plan.

The introduction lists the objectives of the deliverable and mobility assessment.

Next, the mobility assessment related 1st, 2nd and 3rd level research questions are listed together with the hypotheses linked to the research questions. After this, the key research questions were identified. This was done as all possible research questions are not feasible to be studied in TeleFOT with regard to the ITS functions in question, i.e. navigation (NAV), traffic information (TI), speed alert (SA), speed information (SI), and green driving (GD). Hence, the key research questions for TeleFOT mobility assessment were identified with an analysis of the importance of each research question with regard to the TeleFOT function as well as the feasibility of data collection.

Data and the variables to be collected were then determined for each of the key research questions.

The overall mobility impact assessment approach was described next. The assessment is focussing on travel diaries in the large-scale FOTs. The assessment approach description includes the tentative contents of the travel diaries, study design, variable transformations foreseen, testing of hypothesis and data collection responsibilities.

Finally the primary risks were described along with solutions proposed to deal with these risks.

The mobility assessment plan will be updated on the basis of the experience accumulated during the first analyses of the data from pilot tests and/or before studies.

1. INTRODUCTION

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

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

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

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

The analysis undertaken within the TeleFOT project aims to assess the impact of after market nomadic devices in five distinct assessment areas; Safety, Mobility, Efficiency, Environment and User Uptake. In order to measure the impacts SP2, in collaboration with SP4, has developed core research questions and hypotheses for each assessment area that also take into account the functionality of the devices specifically under consideration in TeleFOT. The next stage is to provide details regarding the analysis techniques that will be used to answer each hypothesis. Thus, each analysis plan deliverable details the proposed approach to be followed but does not give analysis outputs.

The primary objective of each analysis plan therefore is to take each hypothesis and identify the most appropriate analysis approach for testing the hypothesis and to identify the type of data that will be used including whether from an LFOT, a DFOT or a combination of both. This builds further upon the tables in D2.2.1 (Appendix III.i – III.v) and delivers important information to SP3 regarding the finer detail of the FOT experimental design and sample size requirements. There will, as indicated in WP4.2 – co-ordination and review, be a co-ordinated approach in developing the analysis plans across the impact areas so that the analysis methods are harmonised where there is hypothesis overlap between the impact areas.

It is anticipated that the analysis plans will provide the final link, along with information from SP2 and the capabilities of the data loggers, that will allow the data specification to

be completed within the Data Working Group (WP2.3 task 2.3.1) and the data base structure to be finalised (WP2.3, WP3.7, WP4.1)

The objective of this deliverable is to provide an analysis plan for mobility assessment in TeleFOT. The data in the TeleFOT evaluation database will be prepared with the help of this deliverable for the analysis of driver and travel behaviour so that the impact of the TeleFOT functions on these can be studied across the different sites and different types of data (large-scale and detailed field operational tests). This means the aggregation of data in manners to be defined together with SP2. The supreme goal is to ensure that conclusions can be drawn and estimates of the impacts on a statistically robust basis can be calculated.

Mobility is usually defined as the ‘‘potential’’ for movement. This potential is conditioned based on the mobility tools one has access to — car, public transport pass, feet, etc. Unfortunately, we can not measure mobility, the movement potential, directly. Hence, we need to use an imperfect measure, revealed mobility. Transport mobility means revealed mobility in terms of the benefits derived from travel activities. Transport mobility includes at least one or more of the following dimensions: (i) access to desired places such as socializing with family and friends; (ii) psychological benefits when social interaction and independence are important to the individual; (iii) the physical benefits of movement; (iv) the maintenance of social networks; and, (v) emotional security benefits of potential travel. See Annex 2 for more details and references on mobility.

In TeleFOT, the actual analyses will focus on changes in:

- individual travel behaviour – trip decision, choice of mode, choice of route, etc.
- overall mobility – travel kilometres and hours

The emotional and psychological benefit of movement will also be studied to some extent in terms of journey quality. The analysis plan will also list in detail the key research questions, hypotheses and the resulting evaluation criteria and indicators.

Separate analyses will be carried out for different evaluation data (large-scale and detailed FOT), but the mobility assessment will concentrate on the large-scale FOT because experimental design in detailed FOTs is not efficient for mobility impact assessment which typically appears in longer term use. All analyses will be carried out across the sites, but also by site in cases where additional data is available. Most analyses are quantitative, aiming at numerical estimates of the impacts, but some will also be qualitative. All estimates will be subject to standard statistical tests of

significance and validity. The analyses will be complemented with context and background information to clarify and interpret the findings.

The choice of study design and data to be collected have been done in cooperation with the other assessment work packages in TeleFOT SP4 in cooperation with SP2 and SP3.

2. DATA

2.1. Research questions

The mobility research questions developed in cooperation with SP2 are presented in Table 1. SP2 developed the structure of three levels of research questions to theoretically cover mobility impacts. Testable hypotheses were formulated for the third level hypotheses. The selection of mobility research questions is identical to what was presented in the D2.2.1.

Table 1. Mobility research questions of the first, second and third levels provided by D2.2.1.

Primary Research Question	Second Level Research Question	Third Level Research Question
AMOUNT OF TRAVEL (Is there a change in the total amount of travelling?)	NUMBER OF JOURNEYS (Is there a change in the number of journeys in total?)	Is the number of journeys undertaken affected in total?
		Is the number of commuting journeys affected?
		Is the number of other work related journeys affected?
		Is the number of other home related journeys affected?
		Is the number of other journeys affected?
	LENGTH OF JOURNEYS (Is there a change in the length of journeys?)	Is the length of journeys in distance affected?
		Is the duration of journeys in time affected?

Primary Research Question	Second Level Research Question	Third Level Research Question
TRAVEL PATTERNS (Is there a change in the travel patterns?)	TRAVEL MODE (Is there a change in the mode of travel?) This includes all alternative forms of travel, including walking	Is there a change in commuting mode of travel?
		Is there a change in mode of travel for other than work related journeys?
		Is there a change in use of public transport?
	ROUTE (Is there a change in driving routes?)	Is there a change in route choice in commuting?
		Is there a change in route choice in other journeys?
		Is travelling on motorways affected?
		Is travelling on scenic routes affected?
		Is travelling in residential areas/minor roads affected?
	TIME BUDGET (Is there a change in the time allowed for the journey?)	Is there a change in time allocated to or planned for travel?
		Is there a change in target speed? (the speed a driver would aim to use in free flow conditions)
	TIMING (Is there a change in the timing of travel?)	Is there a change in the start time of a commuting journey?
		Is there a change in starting other journeys?

Primary Research Question	Second Level Research Question	Third Level Research Question
TRAVEL PATTERNS (cont.) (Is there a change in the travel patterns?)	TIMING (cont.) (Is there a change in the timing of travel?)	Is there a change in travelling in adverse conditions (dark, fog, slippery road, etc.)?
	DESTINATION (Is there a change in destination of travel?)	Is there a change in travel destinations? (e.g. going shopping to somewhere else than usually)
MOBILITY CHOICE (Is there a change in mobility options such as available modes, routes, departure times etc. in the opinion of the users?)	ENABLERS (Does the function enable mobility?)	Are mobility options increased?
		How are the mobility options increased?
	CONSTRAINTS (Does the function constrain mobility)?	Are mobility options decreased?
		How are the mobility options decreased?

Primary Research Question	Second Level Research Question	Third Level Research Question
JOURNEY QUALITY (Is there a change in user comfort?)	STRESS (Is there a change in user stress?)	Is there a change in user stress?
		Is there a change in user uncertainty?
	SUBJECTIVE SAFETY (Is there a change in user comfort?)	Is there a change in feeling of subjective safety?
	COMFORT (Is there a change in user comfort?)	Is there a change in feeling of comfort?
	OTHER JOURNEY QUALITY (Is there a change in other journey quality factors?)	Is there a change in journey quality?
		How are journey quality related factors changing?

All possible research questions can not be answered in TeleFOT for the common functions agreed, i.e. navigation (NAV), traffic information (TI), speed alert (SA), speed infomation (SI), and green driving (GD). An analysis of the importance of each research question with regard to the TeleFOT function as well as the feasibility of data collection was carried out to identify the key research questions for mobility assessment in TeleFOT. The results of this analysis are shown in Table 2. The original research questions provided by D2.2.1 were slightly modified in some cases.

Table 2. The importance and feasibility of mobility related research questions in TeleFOT. High importance and good feasibility are indicated by green, adequate importance and feasibility by amber, and poor importance and feasibility by red.

Third Level Research Question	Important in relation to the function assessed in the project/impact measurability of RQ/other rationale	Feasibility of collecting data to answer hypotheses
Is the number of journeys undertaken affected in total?	NAV, GD, TI likely affect decisions of whether to travel somewhere or not, and thereby number of journeys. SA, SI only indirect effect via travel comfort, likely very low.	Feasible with appropriate travel diaries.
Is the number of commuting journeys affected?	The likely effect on the number of commuting journeys is very low.	N/A
Is the number of other work related journeys affected?	The likely effect on the number of work related journeys is very low.	N/A
Is the number of other home related journeys affected?	NAV, GD, TI likely affect travel decisions of personal journeys, and thereby number of journeys. SA, SI only indirect effect via travel comfort, likely very low.	Feasible with appropriate travel diaries.
Is the number of other journeys affected?	NAV, GD, TI likely affect travel decisions of personal journeys, and thereby number of journeys. SA, SI only indirect effect via travel comfort, likely very low.	Feasible with appropriate travel diaries

Third Level Research Question	Important in relation to the function assessed in the project/impact measurability of RQ/other rationale	Feasibility of collecting data to answer hypotheses
Is the length of journeys in distance affected?	NAV, GD, TI likely affect travel decisions of personal journeys including the destinations and routes, and thereby length of journeys. SA, SI only indirect effect via travel comfort, likely very low. Total journey length is a key indicator for mobility, and should be included in the analyses.	Partly feasible with appropriate travel diaries, but subjective distance estimates are only crude estimates. Changes can still probably be estimated with some confidence. Data logger based coordinates could also be used but will require a lot of work.
Is the duration of journeys affected?	NAV, GD, TI, SA, SI likely affect travel decisions of personal journeys, and thereby duration of journeys	Feasible with appropriate travel diaries. Separation between journeys with matched start/end point and other journeys.
Is there a change in commuting mode of travel?	NAV, GD, TI may affect travel mode for also regular trips, of which commuting trips are most frequent and time-space-constrained. SA, SI only indirect effect via travel comfort, likely very low.	Feasible with appropriate travel diaries. Changes in commuting journeys are most likely to provide sufficient material for data collection.
Is there a change in mode of travel for other than work related journeys?	NAV, GD, TI may affect travel mode for also other trips. SA, SI only indirect effect via travel comfort, likely very low.	As such, data collection is feasible via travel diaries. As data is more scarce and also varied on other journeys, it may be unlikely to get sufficient material for statistical significant changes.
Is there a change in use of public transport?	TI and NAV may affect also the share of public transport travel, and GD indirectly or even directly in the long term. The other functions are unlikely to affect multimodal travel.	As such, data collection is feasible via travel diaries. As data is more scarce and also varied for multimodal travel, it may be unlikely to get sufficient material for statistical significant changes.

Third Level Research Question	Important in relation to the function assessed in the project/impact measurability of RQ/other rationale	Feasibility of collecting data to answer hypotheses
Is there a change in route choice in commuting?	All systems likely affect route choice, especially NAV and TI. Route choice may have considerable impact on journey duration and length, and thereby mobility	Feasible with appropriate travel diary or vehicle tracking afterwards via coordinates and time stamps. Commuting journeys may also provide sufficient material to draw conclusions of statistical significance.
Is there a change in route choice in other journeys?	All systems likely affect route choice, especially NAV and TI. Route choice may have considerable impact on journey duration and length, and thereby mobility	The other journeys are very varied and their number is also probably varying quite a lot from time to time. It would require quite extensive data collection to get sufficient material for analysis.
Is travelling on motorways affected?	All systems likely affect also use of motorways, especially NAV and TI, depending on whether such roads are available. This has some impact on journey duration and length, and thereby mobility	This effect is very much dependent on local conditions and personal situations. It would require quite extensive and complicated data collection to get sufficient material for analysis.
Is travelling on scenic routes affected?	NAV likely affects driving on scenic routes, but the effect on total mobility is of secondary importance.	This can be crudely studied by questionnaires.
		This effect is very much dependent on local conditions and personal situations. It would require very extensive and complicated data collection to get sufficient material for analysis.

Third Level Research Question	Important in relation to the function assessed in the project/impact measurability of RQ/other rationale	Feasibility of collecting data to answer hypotheses
Is travelling in residential areas/minor roads affected?	All systems likely affect also use of residential area roads and other minor roads, especially NAV and TI. This has some impact on journey duration and length, and thereby mobility.	This effect is very much dependent on local conditions and personal situations. It would require quite extensive and complicated data collection to get sufficient material for analysis.
Is there a change in time allocated to or planned for travel?	All systems likely affect personal time budgets for travel. This has a direct impact on mobility.	Feasible only with driver interviews, preferably accompanying the driver which will be very costly. Travel diaries and questionnaires may shed some light, but it is questionable whether to sufficient extent to draw any conclusions
Is there a change in target speed?	SA, SI, GD likely affect target speeds, and NAV and TI may also do so. This is also somewhat relevant for mobility.	Feasible only with driver interviews accompanying the driver combined to data logging which will be very costly. Questionnaires and other interviews may shed some light, but it is questionable whether to sufficient extent to draw any conclusions.
Is there a change in the departure time of a commuting journey?	All systems may affect commuting journey start up time, depending on the driver's situation. This impact may change in time, after experience with the system. The change in start time has direct and relevant impact on personal mobility.	Feasible with appropriate travel diaries. Commuter journeys will likely provide sufficient material to draw statistically significant conclusions.

Third Level Research Question	Important in relation to the function assessed in the project/impact measurability of RQ/other rationale	Feasibility of collecting data to answer hypotheses
Is there a change in the departure time of other journeys?	All systems may also affect the start time of other journeys, with direct impact on personal mobility.	As many other journeys are not time-constrained, it will be difficult to collect sufficient material to make comparisons or draw any conclusions.
Is there a change in travelling in adverse conditions (dark, fog, slippery road, etc.)?	NAV, TI likely affect journeys in adverse conditions by making them easier.	Travelling in dark is defined based on clock times in travel diaries. Other aspects require matching to other data, e.g. road weather.
Is there a change in travel destinations?	NAV is likely to affect journeys to unknown destinations. Other systems likely to have little or no effect.	Questionnaires will provide a subjective response. Inclusion of "known/unknown" attribute to destination to travel diary possible but perhaps not feasible.
Are mobility options increased?	NAV, TI, GD likely increase mobility options, but the effect is expected to be quite small	Can be collected via open questions and interviews; not very feasible for structured surveys.
How are the mobility options increased?	Relevant for explaining how mobility is increased.	Can be collected via open questions and interviews; not very feasible for structured surveys
Are mobility options decreased?	GD, SA likely decrease mobility options, but the effect is expected to be quite small.	Can be collected via open questions and interviews; not very feasible for structured surveys.

Third Level Research Question	Important in relation to the function assessed in the project/impact measurability of RQ/other rationale	Feasibility of collecting data to answer hypotheses
How are the mobility options decreased?	Relevant for explaining how mobility is decreased.	Can be collected via open questions and interviews; not very feasible for structured surveys.
Is there a change in user stress?	All systems likely affect user stress, which in turn affects mobility by making travelling more or less attractive, and helps to understand the possible changes in it.	Easy to collect data with appropriate questionnaires, with stress explained in an unambiguous, explicit manner.
Is there a change in user uncertainty?	All systems likely affect user uncertainty, which in turn affects mobility by making travelling more or less attractive, and helps to understand the possible changes in it	Easy to collect data with appropriate questionnaires, with uncertainty explained in an unambiguous, explicit manner
Is there a change in feeling of subjective safety?	All systems except for GD likely affect subjective safety and security, which in turn affects mobility by encouraging to drive to unfamiliar destinations and in adverse conditions, and helps to understand the possible changes in it.	Easy to collect data with appropriate questionnaires, with safety explained in an unambiguous, explicit manner.
Is there a change in feeling of comfort?	All systems likely affect user comfort, which in turn affects mobility by making the travelling more or less attractive, and helps to understand the possible changes in it.	Easy to collect data with appropriate questionnaires, with comfort explained in an unambiguous, explicit manner.
Is there a change in journey quality?	There is likely an effect but this is hard to anticipate in detail and thereby operationalise and measure; only open questions possible	Very difficult to describe quality in other terms than above for comfort etc., and thereby difficult to collect consistent data

Third Level Research Question	Important in relation to the function assessed in the project/impact measurability of RQ/other rationale	Feasibility of collecting data to answer hypotheses
How are journey quality related factors changing?	There is likely an effect but this is hard to anticipate in detail and thereby operationalise and measure; only open questions possible	Very difficult to describe quality in other terms than above for comfort etc., and thereby difficult to collect consistent data. Nevertheless, this issue would be worth investigation

2.2. Hypotheses to be tested

The hypotheses related to the selected third level research questions are listed in Table 3.

Table 3. Possible hypotheses related to the selected mobility research questions as indicated in D2.2.1.

Third level research question	Possible hypotheses
Is the number of journeys undertaken affected in total?	Number of journeys undertaken is likely to increase (NAV, TI)/ decrease (GD) when device in use compared to when not in use
Is the number of other home related journeys affected?	Number of other home related journeys undertaken is likely to increase (NAV, TI)/decrease (GD).
Is the number of other journeys affected?	Number of other journeys undertaken is likely to increase (NAV, TI)/decrease (GD).
Is the length of journeys in distance affected?	There is likely to be an increase (TI)/decrease (GD) in travelled distance. NAV is likely to decrease distance in matched origin/destination but increase other distances
Is the duration of journeys affected?	There is likely to be an increase (SA, SI, GD)/decrease (NAV, TI) in time spent travelling.
Is there a change in commuting mode of travel?	There is likely to be an increase (NAV, TI) /decrease (GD) in the use of private car for commuting.
Is there a change in route choice in commuting?	There is likely to be different route choice in commuting (especially TI, NAV, GD).
Is there a change in departure time of a commuting journey?	Users postpone/start earlier (especially TI, GD) their commuting journeys
Is there a change in travelling in adverse conditions (dark, fog, slippery road, etc.)?	There is likely to be an increase in journeys in the dark due to NAV and TI

Third level research question	Possible hypotheses
Is there a change in user stress?	There is likely to be an increase (GD, SA)/decrease (NAV, TI, SI) in user stress.
Is there a change in user uncertainty?	There is likely to be a decrease in experiencing uncertainty
Is there a change in feeling of subjective safety?	There is likely to be an increase in user feeling of safety
Is there a change in feeling of comfort?	There is likely to be an increase in user feeling of comfort as the user is better informed and prepared to meet any problems

2.3. Variables required

The detailed linking of the variables to the hypotheses is shown in Annex 1. The summary of all variables required for the mobility assessment and the testing of the hypotheses is listed in Table 4.

Table 4. Variables required by mobility assessment.

Variables to SELECT on **(variables that the FOT must record/measure so that you can SELECT the appropriate data files for analysis)**		
Measure	**Data source**	**Whether in L +/or D-FOT**
Specific driver	Data logger (if only one possible driver per vehicle) OR Travel diary	L-FOT
Type of journey	Travel diary	L-FOT
Time of journey	Travel diary OR Data logger	L-FOT
Date of journey	Travel diary OR Data logger	L-FOT
Mode of journey	Travel diary	L-FOT
Sunrise and sunset times	Almanacs	

Variables to ANALYSE (variables that the FOT must record / measure so that you can ANALYSE the impact of the nomadic device, i.e. the dependent variables)		
Measure	**Data source**	**whether in L + / or D-FOT**
Time of journey	Travel diary OR Data logger	L-FOT
Date of journey	Travel Diary OR Data logger	L-FOT
Length of journey (km)	Travel diary OR Data logger	L-FOT
Duration of journey (journey end vs departure times)	Travel diary OR Data logger	
Mode of journey	Travel diary	L-FOT
Route of journey (GPS track or manual description)	Travel diary OR Data logger	L-FOT
Departure time of journey	Travel Diary OR Data logger	L-FOT

Variables to INTERPRET results (variables that the FOT must record/measure so that you can INTERPRET the results and come to conclusions about why the effects have occurred)		
Measure	**Data source**	**whether in L +/or D-FOT**
Reason for using ND on this journey/leg/link	Travel diary OR Interview OR Background questionnaire	L-FOT
Attitudes to: - environment - technology - travel costs	Background questionnaire	L-FOT
Perceived changes in: - stress - comfort - uncertainty feeling of safety	Background questionnaire	L-FOT

3. GENERAL APPROACH FOR THE IMPACT ASSESSMENT

3.1. Contribution from Partners

The partners expected to make a contribution to WP4.4 and in particular to task 4.4.1 data analysis are shown in Table 5.

Table 5. Contribution from Partners to mobility assessment.

Partner	Contribution	Man Months
VTT	Task and WP leader; Responsibility for FOT data from Finland; Link between data analysis and Task 2.2.2 Research questions & indicators; D4.4.1 Impacts on mobility – data analysis plan; D4.4.2 Impacts on mobility – preliminary results	4
CRF	Contribution to the data analysis in the Italian test site	3
CERTH/HIT	Responsibility for FOT data from Greece	1
CHALMERS	Responsibility for FOT data from Sweden Link between data analysis and Task 2.2.3 Experimental design	4
CIDAUT	Responsibility for FOT data from Spain Combined analysis from data obtained in FOTs and detailed FOT focusing on mobility related aspects. Link with Task 5.1.2 Communication and liaison to other SPs	4
ICCS	Contribution to data analysis for Greek FOT	3
IKA	Contribution to the analysis of data from FOTs	3
LOUGH	Responsibility for FOT data from UK Link between data analysis and Task 2.3.2 Quality of data	3
UNIMORE	Collaborate with other partner, in particular Italian partner, to analyse the data of driver and travel behaviour. Prevalent emerging behaviour will be accurately described in order to allow comparisons across areas.	3
ETRA	Contribute to data analysis from Spanish FOT	3

Each TeleFOT FOT site will collect the travel diary data ensuring that sufficient high percentage of diaries (>80%) delivered at each site are returned filled in during each phase of data collection. This is the responsibility of the following partners for the different test sites, with the supporting partners shown in parentheses:

- Finland VTT
- Spain CIDAUT
- Greece CERTH/HIT (ICCS)
- UK LOUGH
- Germany IKA
- Sweden Chalmers
- Italy CRF (UNIMORE)

All sites will use identical travel diaries translated into the national languages by the site responsible partners. All WP4.4 site responsible partners will be responsible for the data collection for their test sites, including the coding of the travel diaries into the TeleFOT evaluation data base.

Analysis that requires LFOT data should be undertaken by the WP4.4 leader and other partners specified in the DoW with recourse for the activity. This is co-ordinated by the WP4.4 leader and appropriate guidance given to each partner involved in helping with the analysis. Again, templates to be completed with results should be provided in line with the analysis plans by the WP4.4 leader.

The WP4.4 leader has responsibility for bringing all of the results together and, in discussion with other partners who have resources (DoW), interpreting the results and forming conclusions.

Test sites and their responsible partners listed above are obliged to provide the data to answer the core TeleFOT hypotheses as a priority. Other issues can only be explored if there are resources remaining within WP4.4 once the core TeleFOT analysis has been undertaken.

3.2. Study design and analysis strategy

The mobility impact assessment is almost totally dependent on data collected by travel diaries in large-scale FOTs. This is because only these will provide data on the journeys undertaken by the person in question. Experiences from travel diary studies indicate that very few people are willing to fill in detailed travel diaries for periods longer than a week. The travel diary should contain at least the following information about all journeys undertaken by the person during a number of days (e.g. a week):

- From what type of place did you start the trip?
- What time did you start the trip (hh:mm)?
- List the modes of travel you used in the order of use
- What type of place was your destination?
- What time did you end the trip (hh:mm)?
- How long was the trip (100 m accuracy)?
- What was the purpose of the trip (type of journey)?
- Which TeleFOT functions did you use before the trip?
- Which TeleFOT functions did you use during the trip?
- Which TeleFOT functions did you use after the trip?
- Was there anything unusual about this journey, eg poor weather, accident causing traffic congestion etc?

Travel diaries are to be collected for both the test persons and control persons in the before phases as well as at two times during the after phase as illustrated in Figure 1. Background questionnaires need to be collected both in the before and after phases.

Device into use

	Month -1 (Before)	Month 1...3	Month 4...6	Month 7...9	Month 10...12
Test group	Travel diary Question-naire		Travel diary		Travel diary Question-naire
Control group	Travel diary Question-naire		Travel diary		Travel diary Question-naire

Figure 1. Mobility assessment study design.

All hypotheses will be tested against the null hypothesis that the TeleFOT function(s) has (have) no influence on the particular aspect of mobility. An additional hypothesis for all research questions is that the effect is changing after getting more experience with the function(s).

Hence all analyses will compare the distribution, mean and median values of the response variables ("variables to analyse" in the previous tables) between before and after phases for both the test and control groups. Standard statistical methods such as variance analysis will be utilised.

3.3. Preprocessing of data

The variables require some transformation for the analyses, see Table 6. Note that the "raw" data i.e. the basis of the transformations will also remain in the data base.

Table 6. Variable transformations foreseen for mobility assessment.

Data collected	Transformation for analysis	Noteworthy
Time of journey (hh:mm–hh:mm)	Time of day (morning peak, day, afternoon peak, evening, night)	
	Daylight/twilight/dark	Comparison to local sunrise/ -set times based on date
Date of journey (YYMMDD)	Day of week	
Length of journey (km)	Daily total distance travelled by type of journey (commuting, other work related, shopping, hobby, leisure etc.)	
Duration of journey (h)	Daily total time spent travelling by type of journey	
Modes of journey (trip chain)	Primary mode of travel	Via heuristic rule
	Daily primary mode distribution	
Route of journey	Change from before phase, e.g. % change by distance (after phases only)	Only for commuting trip; comparison to logger data; data excluded for persons whose home or work address change during FOT
Departure time of journey (hh:mm)	Morning commute start time	
	Afternoon commute start time	

The questionnaires will be used to collect data on the changes in user stress, uncertainty, feeling of subjective safety, and feeling of comfort as well as socio-economic data and information about the person's attitudes. This is used to explain the impacts on mobility.

The results of the mobility assessment will be compared to the driver behaviour data collection via data loggers to check for any inconsistencies.

3.4. Consolidation across impact areas

The consolidation of analysis results will be overseen by WP4.2 – co-ordination. This will ensure that each impact area takes a broad view of all of the results coming from each of the test sites and from all of the hypotheses. In order to keep each impact area manageable, the prioritisation of Hypotheses has taken place as described above. However, it is still important to review all of the results in order to establish whether further impacts are seen that need to be considered beyond the Hypotheses considered in this draft analysis plan.

3.5. Strategy for Global Assessment

As with all FOT data, in TeleFOT there will be a requirement to generalise the results to the general driving population – otherwise there is little overall value in conducting the FOT in the first place. However, this is not straightforward and the main problem is determining how close the TeleFOT subjects represent the target population.

A straightforward method in statistical analysis is to simply pool the data from different sites to form a single data set and perform statistical analysis as if they were measured in a single site. Due to the different driving rules and regulations, and potentially different driving characteristics of drivers in the different countries, this approach is not efficient because the country-to-country variation is not taken into consideration in the analysis. Instead we shall incorporate more complicated linear mixed-effect models which include both fixed effects and random effects in the analysis. Specifically, the hypotheses formulated in the previous sections are tested using linear mixed-effect models, where a factor termed ‘country’ is included and is treated as a random effect in the models so that the country-to-country variation is taken into account when we test the effect of device in use on the primary variables of interest. Mobility impact assessment will be made within comparable trips.

Naturally, the extent to which data from different countries can be combined will vary according to the hypothesis under test and the data on which it depends

3.6. Strategy for dissemination of results – short and long term

The following will be considered and employed as and when appropriate in order to ensure timely dissemination of the results;

- Individual test site feedback to local stakeholders
- Stakeholder forums organised through SP5
- Presentation of key results at relevant conferences and other forums in the international arena
- Utilisation of the FOTNET forums
- Publications in recognised international journals
- Press releases (organised through SP5)
- TeleFOT website

4. RISK ASSESSMENT

No matter how well the data collection, collation and storage processes have been performed, it is likely that there will be problems and constraints with the data analysis. Contingencies may be required in the event that problems occur with missing, lost, erroneous and inconsistent data.

Table 7 summarises the risks that are inherent in TeleFOT data collection, how the risk can be managed and proposed solutions in the event that the identified risk becomes a reality. This table has been prepared previously as part of Deliverable 2.3.1 and is a manifestation of the work that was undertaken within FESTA within the data quality task. The basic principles that are generically outlined in the Contingency Plan apply to all Assessment activities (Safety, Mobility, Environment, Efficiency, User Uptake).

Table 7. TeleFOT Generic Data Contingency Plan

Risk including risk severity (e.g. low, medium, high)	Reduction (how the risk can be managed)	Solution (if the risk happens)
Missing data at point of collection (medium risk, medium severity)	Arrange check-list of required data-fields to ensure that collection is fully specified. Covered in Task 2.2.2 re data spec and WP2.3 re data acquisition and quality.	Missing data will be denoted as such in analyses and caveats will be applied to results.
Loss of data post-collection (low risk, high severity)	Ensure that data back-ups are provided (main server and DVD)	Back-up will be utilized. If data cannot be recovered, same caveats as above will be applied
Inconsistent data across test communities meaning comparisons cannot be made (low risk, medium severity)	Data quality ensured in Task 2.3.2, Pilot data analysis conducted in WP4.1. Data consistency will be ensured through the review process of WP4.2	In this unlikely event, data analyses will not be conducted where data inconsistencies are found

Risk including risk severity (e.g. low, medium, high)	Reduction (how the risk can be managed)	Solution (if the risk happens)
Insufficient data to ensure scientific rigour/statistically valid outcomes (medium risk, high severity)	This will be established and addressed in a pilot study (WP4.1) – any indications that the data will not give statistically robust results will result in revision of methods, tools and data specification (WP2.2&2.3)	In this unlikely event, the data analyses will be modified accordingly and the validity of the outcomes described.
Late identification of needed analysis and analysis procedures cannot accommodate it (medium risk, medium severity)	WP2.2 takes input from FESTA and identifies research questions & indicators which should avoid late identification of required analyses. Task 2.3.3 will identify database structure and incorporate flexibility to respond to unpredicted analysis requirements. Pilot study in WP4.1 will test analysis procedures.	All efforts will be made to include the required analyses. Where this is not possible, the risk management strategies should have ensured that this analysis is not core to the needs of the impact assessment.
Privacy of participant data compromised (low risk, high severity)	Covered by WP3.7 all reasonable measures will be taken to ensure privacy. Protocols will be developed based on expert advice. Data stored in lockable filing systems – no personal data stored on database. Participant identification shredded shortly after use.	Participants will be informed of privacy compromise and appropriate remedial actions will be taken in consultation with participants.
Commercially confidential data compromised (low risk, high severity)	Covered by WP3.7. Protocols will be developed. Stakeholders will be informed before participation that all reasonable measures will be taken to ensure commercially sensitive information will be kept confidential. Covered by consortium agreement plus other appropriate documentation as advised by experts.	Stakeholders will be informed of compromise and appropriate remedial actions will be taken in consultation with stakeholders.

Risk including risk severity (e.g. low, medium, high)	Reduction (how the risk can be managed)	Solution (if the risk happens)
Non-agreement on aspects of data analysis between SP4 partners (medium risk, medium severity)	Multiple partners in WPs on analysis and implications (WPs 4.3-4.7). All analysis WP partners have significant expertise in the relevant areas and have common research motivations. All analysis work packages lead by independent research organizations rather than commercial partners.	Conflict resolution procedures defined in consortium agreement and managed in WP1.1
Conflicts of needs between SP4 and SP2 (low risk, medium severity)	Common partners in SP2 & SP4	Conflict resolution procedures defined in consortium agreement and managed in WP1.1
Conflicts of needs between SP4 and SP3 (low risk, medium severity)	Common partners in SP3 & SP4	Conflict resolution procedures defined in consortium agreement and managed in WP1.1
Benchmarking/crash-tests identify planned devices/applications as intrinsically unsafe and/or unusable in FOTs (low risk, high severity)	FOTs are using mature technologies hence the risk of unsafe/unusable systems should be low.	Stakeholders and partners responsible for national FOTs will be informed of results of crash-tests and recommended remedial actions will be proposed (e.g. restricted use of devices/functions or alternative devices/functions used)
Systematic changes in the information given via travel diary, especially in before-after design	Same information on trip duration and length etc. should be given to test persons in all phases of the study	Comparison of log data with diary data to assess the magnitude of the error

Other Potential Problems and Solutions

The main risks in TeleFOT mobility assessment are the following:

1. statistically significant conclusions can not be drawn due to the sizes of the test and control groups being insufficient with regard to the small magnitude of the mobility changes
2. travel diary data is too patchy, scarce and unrepresentative for analysis

The first risk will be managed by collecting enough days of travel diary data. This is tricky as persons may be reluctant to fill in travel diaries for several days. Hence, the local TeleFOT partners must devote special attention to continuous contact and feedback towards the persons participating in the FOTs, urging and reminding them of the need to fill in the diaries. A specific procedure will be agreed about this between the test sites.

The second risk is also dealt with by the local TeleFOT partners' active contacts and attention to the respondents. All sites must have a response rate or more than 80%. The representativeness issue is dealt with in the choice of the FOT user participants.

5. SUMMARY

Sub-project 4 of TeleFOT deals with the evaluation and assessment of data collected during the various FOTs throughout the test-sites in the project. The prime aim is to ensure that appropriate and rigorous analyses can be conducted in order to identify the impacts of aftermarket and nomadic device/function use with confidence and validity.

The deliverable contains the outline mobility assessment plan.

The introduction lists the objectives of the deliverable and mobility assessment.

Next, the mobility assessment related, 1st, 2nd and 3rd level research questions are listed together with the hypotheses linked to the research questions. After this, the key research questions were identified. This was done as all possible research questions are not feasible to be studied in TeleFOT with regard to the ITS functions in question, i.e. navigation (NAV), traffic information (TI), speed alert (SA), speed infomation (SI), and green driving (GD). Hence, the key research questions for TeleFOT mobility assessment were identified with an analysis of the importance of each research question with regard to the TeleFOT function as well as the feasibility of data collection.

Data and the variables to be collected were then determined for each of the key research questions.

The overall mobility impact assessment approach was described next. The assessment is focussing on travel diaries in the large-scale FOTs. The assessment approach description includes the tentative contents of the travel diaries, study design, variable transformations foreseen, testing of hypothesis and data collection responsibilities.

Finally the primary risks were described along with solutions proposed to deal with these risks.

The mobility assessment plan will be updated on the basis of the experience accumulated during the first analyses of the data from pilot tests and/or before studies.

ANNEX 1: VARIABLES REQUIRED BY THE CORE MOBILITY RESEARCH QUESTIONS AND HYPOTHESES.

Table 8. Variables required by the core mobility research questions and hypotheses

MOBILITY: ALL FUNCTIONS (Static navigation, Dynamic navigation, Traffic information, Speed alert, Speed information, Green driving)								
			Variables to SELECT on (variables that the FOT must record/measure so that you can SELECT the appropriate data files for analysis)		**Variables to ANALYSE** (variables that the FOT must record/measure so that you can ANALYSE the impact of the nomadic device, i.e. the dependent variables)		**Variables to INTERPRET results** (variables that the FOT must record/measure so that you can INTERPRET the results and come to conclusions about why the effects have occurred)	
Third Level Research Question	**Hypothesis**	**Impact / Implication**	**Measure**	**Data source & whether in L + / or D-FOT**	**Measure**	**Data source & whether in L + / or D-FOT**	**Measure**	**Data source & whether in L + / or D-FOT**
Is the number of journeys undertaken affected in total?	There is a slight change in the number of car journeys due to improved or reduced travel comfort provided by the nomadic/aftermarket system	An increased number of journeys indicates an increase in the mobility of the users	Specific driver	Data logger (if only one possible driver per vehicle) + travel diary (if multiple drivers per vehicle) L	Time of journey	Travel diary OR Data logger L	Reason for using ND on this journey/leg/link	Travel diary OR Interview L
	IMPORTANT NOTES FOR THIS HYPOTHESIS It is essential to control for the effects of all confounding factors on this hypothesis as we know that day of week, time of year etc will affect this		Type of journey	Travel diary L	Date of journey	Travel diary OR Data logger L	Attitudes to: - environment - technology - travel costs	Background questionnaire L
							Perceived changes in: - stress - comfort - uncertainty - feeling of safety	Background questionnaire L
Is the number of other home related journeys (than commuting) affected?	There is a slight increase in the number of journeys due to improved travel comfort provided by the nomadic/aftermarket system	An increased number of journeys indicates an increase in the mobility of the users	Specific driver	Data logger (if only one possible driver per vehicle) + travel diary (if multiple drivers per vehicle) L	Time of journey	Travel diary OR Data logger L	Reason for using ND on this journey/leg/link	Travel diary OR Interview L
	IMPORTANT NOTES FOR THIS HYPOTHESIS It is essential to control for the effects of all confounding factors on this hypothesis as we know that day of week, time of year etc will affect this		Type of journey	Travel diary L	Date of journey	Travel diary OR Data logger L	Attitudes to: - environment - technology - travel costs	Background questionnaire L
							Perceived changes in: - stress - comfort - uncertainty - feeling of safety	Background questionnaire L

Is the number of other journeys (than home or work related) affected?	There is a slight increase in the number of journeys due to improved travel comfort provided by the nomadic/aftermarket system	An increased number of journeys indicates an increase in the mobility of the users	Specific driver	Data logger (if only one possible driver per vehicle) + travel diary (if multiple drivers per vehicle) L	Time of journey	Travel diary OR Data logger L	Reason for using ND on this journey/leg/link	Travel diary OR Interview L
	IMPORTANT NOTES FOR THIS HYPOTHESIS It is essential to control for the effects of all confounding factors on this hypothesis as we know that day of week, time of year etc will affect this		Type of journey	Travel diary L	Date of journey	Travel diary OR Data logger L	Attitudes to: - environment - technology - travel costs	Background questionnaire L
							Perceived changes in: - stress - comfort - uncertainty - feeling of safety	Background questionnaire L
Is the length of journeys in distance affected?	There is likely to be a change in travelled distance due to the route or destination related information provided by the system to the driver	An changed length of journeys combined with the total number of journeys will indicate whether the total mobility has increased or decreased (in addition to safety, environment, etc effect)	Specific driver	Data logger (if only one possible driver per vehicle) + travel diary (if multiple drivers per vehicle) L	Lenght of journey (km)	Travel diary OR Data logger L	Reason for using ND on this journey/leg/link	Travel diary OR Interview L
	IMPORTANT NOTES FOR THIS HYPOTHESIS • It is essential to control for the effects of all confounding factors on this hypothesis as we know that day of week, time of year etc will affect this		Type of journey	Travel diary L			Attitudes to: - environment - technology - travel costs	Background questionnaire L
			Time of journey	Travel diary OR Data logger L			Perceived changes in: - stress - comfort - uncertainty - feeling of safety	Background questionnaire L
Is the duration of journeys affected?	There is likely to be a change in time spent travelling because the driver makes a change in route selection or journey timing due to the route or destination related information provided by the system to the driver.	An changed duration of journeys combined with the total number of journeys will indicate whether the total mobility has increased or decreased (in addition to safety, environment, etc effect)	Specific driver	Data logger (if only one possible driver per vehicle) + travel diary (if multiple drivers per vehicle) L	Duration of journey (difference between journey end and start times)	Travel diary OR Data logger L	Reason for using ND on this journey/leg/link	Travel diary OR Interview L
	IMPORTANT NOTES FOR THIS HYPOTHESIS • It is essential to control for the effects of all confounding factors on this hypothesis as we know		Type of journey	Travel diary			Attitudes to: - environment - technology - travel costs	Background questionnaire

	that day of week, time of year etc will affect this • Need to separate between journeys with matched origin and destination pairs and other journeys			L				L
			Date of journey/	Travel diary OR Data logger L			Perceived changes in: - stress - comfort - uncertainty - feeling of safety	Background questionnaire L
Is there a change in commuting mode for travel?	There is a slight change in the use of a specific mode due to changed travel comfort in that mode or due to information provided by the nomadic/aftermarket system	An increased number of journeys indicates an increase in the mobility of the users	Specific driver	Data logger (if only one possible driver per vehicle) + travel diary (if multiple drivers per vehicle) L	Mode of journey	Travel diary L	Reason for using ND on this journey/leg/link	Travel diary OR Interview L
	IMPORTANT NOTES FOR THIS HYPOTHESIS • It is essential to control for the effects of all confounding factors on this hypothesis as we know that day of week, time of year etc will affect this		Type of journey	Data logger + Travel diary L			Attitudes to: - environment - technology - travel costs	Background questionnaire L
			Time of journey	Travel diary OR Data logger L			Perceived changes in: - stress - comfort - uncertainty - feeling of safety	Background questionnaire L
			Date of journey	Travel diary OR Data logger L				
Is there a change in route choice in commuting?	There is a change in route choice in commuting due to the route related information provided by the nomadic/aftermarket system	A changed route indicates an increase in the mobility of the users	Specific driver	Data logger (if only one possible driver per vehicle) + travel diary (if multiple drivers per vehicle) L	Route of journey (GPS track of manual description)	Travel diary OR Data logger L	Reason for using ND on this journey/leg/link	Travel diary OR Interview L
	IMPORTANT NOTES FOR THIS HYPOTHESIS • It is essential to control for the effects of all confounding factors on this hypothesis as we know that day of week, time of year etc will affect this		Type of journey	Data logger + Travel diary L			Attitudes to: - environment - technology - travel costs	Background questionnaire L
			Mode of journey	Travel diary L			Perceived changes in: - stress - comfort - uncertainty - feeling of safety	Background questionnaire L

			Time of journey	Travel diary OR Data logger L				
Is there a change in departure time of commuting journey?	There is likely to be a change in start up time due to the information provided by the system to the driver.	An earlier start time usually indicates decreased mobility, and vice versa	Specific driver	Data logger (if only one possible driver per vehicle) + travel diary (if multiple drivers per vehicle) L	Start time of journey	Travel diary OR Data logger L	Reason for using ND on this journey/leg/link Reason for choice of departure time	Travel diary OR Interview L
	IMPORTANT NOTES FOR THIS HYPOTHESIS • It is essential to control for the effects of all confounding factors on this hypothesis as we know that day of week, time of year etc will affect this		Type of journey	Travel diary L			Attitudes to: - environment - technology - travel costs	Background questionnaire L
			Date of journey	Travel diary OR Data logger L			Perceived changes in: - stress - comfort - uncertainty - feeling of safety	Background questionnaire L
Is there a change in travelling in adverse conditions (dark, fog, slippery road, etc.)?	There is likely to be an increase in travelling in dark due to the support by the system to the driver.	An increase in personal mobility	Specific driver	Data logger (if only one possible driver per vehicle) + travel diary (if multiple drivers per vehicle) L	Date of journey/	Travel diary OR Data logger L	Reason for using ND on this journey/leg/link	Travel diary OR Interview L
	IMPORTANT NOTES FOR THIS HYPOTHESIS • It is essential to control for the effects of all confounding factors on this hypothesis as we know that day of week, time of year etc will affect this		Type of journey	Travel diary L	Time of journey	Travel diary OR Data logger L	Attitudes to: - environment - technology - travel costs	Background questionnaire L
			Sunrise and sunset times	Almanacs			Perceived changes in: - stress - comfort - uncertainty - feeling of safety	Background questionnaire L

Table 9. Valid core research questions also covered by e.g. WP 4.7 User Uptake

Is there a change in user stress?	Use stress is decreased due to the support provided by the nomadic/ aftermarket system	An increase in personal mobility	Specific driver	Questionnaire D (L)	Perceived user stress (qualitative)	Questionnaire L	Attitudes to: - environment - technology - travel costs	Background questionnaire L
Is there a change in user uncertainty?	Use uncertainty is decreased due to the support provided by the nomadic/ aftermarket system	An increase in personal mobility	Specific driver	Questionnaire D (L)	Perceived user uncertainty (qualitative)	Questionnaire L	Attitudes to: - environment - technology - travel costs	Background questionnaire L
Is there a change in feeling of subjective safety?	Feeling of safety is increased due to the support provided by the nomadic/ aftermarket system	An increase in personal mobility	Specific driver	Questionnaire L	Perceived subjective safety or security (qualitative)	Questionnaire L	Attitudes to: - environment - technology - travel costs	Background questionnaire L
Is there a change in feeling of comfort?	Feeling of comfort is increased due to the support provided by the nomadic/ aftermarket system	An increase in personal mobility	Specific driver	Questionnaire L	Perceived feeling of comfort (qualitative)	Questionnaire L	Attitudes to: - environment - technology - travel costs	Background questionnaire L

ANNEX 2 LITERATURE TO SUPPORT MOBILITY RQ AND INDICATOR SELECTION

The driving task can be defined, following Rumar (1993, based on Michon 1985, FESTA D5) into the four levels of strategic, navigation, manoeuvring and controlling task. Decisions like choice of transport mode, time of departure, localising targets, order of targets and routes are made on the strategic level. The navigation task means following the chosen or changed route in traffic. The manoeuvring task means to choose position and course on the road, to choose speed in every situation, to interact with other road users in such a way that mobility is maintained but collision avoided, to follow rules, signs, signals. Finally, the controlling task means to handle the vehicle using controls.

For mobility, impacts of strategic and navigation tasks are clearly most relevant. For traffic safety, environment and efficiency probably all four decision making levels are relevant. However, originally Michon's (1985) model includes the idea of hierarchy; it is the higher level tasks define the lower level tasks (from the strategic task to the controlling task). Consequently, there is a hierarchy in impacts so that top level tasks, especially the strategic task has more significant impacts than lower level tasks like the operating task.

There is also the aspect of subjective and objective mobility. As noted by Collantes and Mokhtarian (2007), "One could answer in terms of a subjective assessment of the amount of travel one does. For example, one could respond 'I travel a lot'. The association between quantitative reports of mobility and personal qualitative judgments of those amounts is not deterministic: subjective assessments of the same objective amount of personal travel will in general vary across individuals." For this reason and for the reasons of socio-economic assessment, the emphasis of TeleFOT is on objective indicators for mobility.

Mobility is usually defined as the ''potential'' for movement. As pointed out by Spinney at al. (2009), this potential is conditioned based on the mobility tools one has access to — car, transit pass, feet, etc. Unfortunately, we can not measure mobility, the movement potential, directly. Hence, we need to use an imperfect measure, revealed mobility. Transport mobility means revealed mobility in terms of the benefits derived from travel activities (Spinney et al. 2009). According to Burns (1999) and Metz (2000), transport mobility should include at least one or more of the following dimensions:(i) access to desired places such as socializing with family and friends; (ii) psychological benefits when social interaction and independence are important to the individual; (iii) the physical benefits of movement; (iv) the maintenance of social networks; and, (v) emotional security benefits of potential travel.

For most individuals, commuting makes a major part of their travelling. Commuting is also different from other types of travel. First, the choice of commuting mode (or rather the main commuting mode) is "restricting" the mode choice of user for the rest of the day as all working place based journeys will be affected by whether the user came in the morning with own car or not. Second, commuting suffers from much more time- and space-related constraints than any other journey types. The origin and destination are both fixed, as well as the working hours to major extent. Hence, in any mobility analysis, it is standard practice to make a difference between commuting and other journeys.

This is the case especially for TeleFOT as we can quite safely assume that only commuting journeys will provide enough consistent and comparable data (same routes on same times of day in similar traffic conditions) to detect any changes between the "with" and "without" or "before" and "after" situations of the users.

For mobility and other assessment of ITS, several guidelines exist for the evaluation of ITS projects and applications. Based on these (Kulmala et al. 2002; Tarry et al. 2008) and Nicolas et al. (2003), we can identify a set of often used indicators for mobility:

- Daily number of trips (overall and by place of residence)
- Structure of trip purposes
- Modal split (over all and by mode of transport)
- Daily average distance travelled
- Average speed (global and per person)
- Daily average time budget
- Total journey time (as such or in comparison with trip taken by private car)
- Ease of travel
- Travel comfort experienced by users
- Feeling of personal security

These are used as the basis for the research questions and indicators for mobility also in the TeleFOT mobility assessments. Naturally, the choice of the research question will rely on the ITS function studied, and its possible impacts on driver mobility related behaviour at the strategic, tactic and operational levels.

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