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Fieldwork monitoring application for decentralized surveys

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1. Executive Summary

This report describes the development of a prototype portable, standardised fieldwork management system (FMS) for the ESS and SHARE based on SHARE's existing system. The FMS will eventually consist of two linked components – a mobile application for interviewers to use and a central server (comprising of a database, admin interface, and communication technology) accessible to survey agencies, national teams and central coordinators. Under the DASISH project it has been possible to create a prototype of the mobile application and the basic structure needed for a central server. The development of both components is described in this report, although there is a greater focus on the development of the prototype mobile application.

In the next section (Section 2), we introduce the original goals specified in the DASISH description of work and summarise what was envisaged for the FMS according to Deliverable 3.6[1]. In Section 3 we provide information about the development of the mobile application – including testing procedures and substantive features. In Section 4 we provide access to the mobile application as it would look on interviewers' smartphones. Section 5 highlights development work still required for the FMS to make it fully operational and Section 6 includes a short discussion and summary.

2. Introduction

2.1 Original goal specified in DASISH Description of Work

The goal of DASISH task 3.3 was to produce a prototype transportable, standardised system of employing and monitoring harmonised metadata[2] files which can aid central fieldwork control, supervision and monitoring. This will draw on SHARE's existing sample management system (SMS) currently built into their CAPI program, to produce a stand-alone portable application compatible with mobile devices. This will be used by interviewers on the doorstep of the target respondent, meaning that information can be recorded in real-time. The mobile application will enable crucial elements of the fieldwork progress to be fed into a central server accessible both to members of the ESS Core Scientific Team (CST) as well as to the NCs in their respective country[3].

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[1] Widdop, S., Prestage, Y., Bristle, J., Kuijten, L., van der Wielen, I., and Halbherr, V. (2013). Design of a standardised sample management system. DASISH Deliverable 3.6.

[2] Both paradata (data about the process of collecting survey data e.g. case level files) and metadata (aggregated data about the data e.g. response rates) will be created by the system.

[3] To ensure confidentiality of data, each National team will only be able to access fieldwork data (case level files) pertaining to respondents in their country. Access to data from respondents in all countries will be restricted to those involved in central coordination.

2.2 What was envisaged in Deliverable 3.6

In DASISH deliverable 3.6 ('Design of standardised sample management system'), we outlined the substantive and technical features that would eventually comprise a new Fieldwork Management System. We envisaged that the new system would draw on both SHARE's existing computerised Sample Management System and the ESS's paper contact forms and would be capable of providing up to date information about fieldwork progress in, or as close to, real-time as possible *during* fieldwork. The new fieldwork management system would consist of two linked components – a mobile application and a central server (comprising of a database, admin interface, and API[4] communication services).

We also proposed that the mobile application would be installed on interviewers' smartphone or hand-held tablet computer, and would work both online and offline. The application would enable interviewers to manage their cases efficiently using filters; conduct household and respondent selection as well as record contact details and neighbourhood context information in 'real-time'. In addition, all information would be synced with and stored in a central server (database). This would simultaneously be accessible to survey agencies, national teams and central coordinators during fieldwork allowing users to create standardised output files to enable effective fieldwork monitoring.

Under the DASISH project, we have been able to develop a prototype mobile application, which contains some of the essential features for fieldwork management. The basic structure needed for a central server has been developed, and it is possible to transfer information between this and the mobile application, using API service protocols. The system does not yet contain all functionalities needed to be a fully operational fieldwork management system as envisaged in deliverable 3.6, therefore it will need further work before being ready to roll out to participating countries.

The deliverable 3.6 provided a detailed design for the technical development, and focused on producing an innovative, user-friendly and ready-to-use tool. However, it did not take into account the resources available under the remaining DASISH months. During the technical development work, we encountered new challenges developing, testing, refining and revising some of the data-models that underlie the mobile application. Therefore we needed to adjust our expected goal, balancing the requirements of the proposed design with the resources available for development.

In the next section, we explore how the prototype mobile application was developed.

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[4] API stands for Application Programming Interface. It is a set of routines and protocols for operating and communicating software operations, inputs and outputs without compromising each other's implementations. The mobile stand-alone client software will communicate using such API services in order to align with data pull and push from the server side.

3. Developing the prototype mobile application

The mobile application was developed using a mobile application development framework called PhoneGap[5]. PhoneGap uses standards-based web technologies to bridge web applications and mobile devices using HTML5 technology. This means that the mobile application is compatible with all mobile devices, regardless of which operating system they use. This ensures a smooth implementation for different users and addresses a broader target group.

3.1 Moving on from Deliverable 3.6

As the DASISH deliverable 3.6 provided a comprehensive list of key features and functionalities needed for a fully operational FMS mobile application, this formed the basic specification for the development of the prototype mobile application. In addition to listing all the features necessary for the prototype, deliverable 3.6 also clearly defined each feature as 'essential' or 'optional', which made it easier to prioritize the features for development (see Tables 1 and 2 in Appendix A for a list of these features).

3.2 Testing the prototype mobile application

We adopted an iterative approach to the development of the mobile application, and testing was carried out at multiple stages of the project lifecycle.

The first testing phase was the most intensive and involved a two day testing period in May at the CentERdata offices in Tilburg. Both researchers and programmers from City University London and CentERdata were involved in the testing, and fixes were carried out on the spot where possible.

The mobile application is designed to aid interviewers by guiding them through a series of ordered steps to help them manage their workload, select a respondent (where named samples are not available), and record all contact attempts.
An equally structured approach to testing was adopted, and several 'test case' scenarios were designed which mirrored the way in which interviewers should be guided by the application.

The first step in designing the test cases was to group the 'essential' and 'optional' features outlined in deliverable 3.6 based on functionality.
Firstly, features were separated into those for the app itself (type A), and those for the central server (type B). The next stage was to further separate the features into the following five broad areas:

1. **Usability** – this included features and functionalities related to the overall design, appearance and use of the app.
2. **Security –** These features were mainly concerned with ensuring that all data was stored securely, and establishing different access rights for different account types.
3. **Data transfer** – these features were concerned with movement of data between the mobile app and the central server.

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[5] www.phonegap.com

4. **Fieldwork processes** includes the features which directly allow interviewers to manage their workload and record their contact attempts.
5. **Outputs –** concerning the central server only, these were features which help to produce usable exports from the systems, allowing national and central teams to monitor interviewer progress.

Once grouped, the final stage was to design a series of test cases which incorporated all features at least once. These would provide a structure to the testing, ensuring that each feature or functionality could be tested to see if it was available and working as expected.

As each test case was designed to be relatively short, the number of features covered by case varied depending on the complexity of the feature.
The cases themselves were a mix of a series of simple instructions (such as 'download the app by clicking the 'install' button') interspersed with some evaluative questions (such as 'how long did that take?'). The responses to these evaluative questions helped to inform the decision as to whether a test case 'passed' or 'failed'. A test case was deemed to have failed if a feature was absent or did not work as expected.

A simple example testing usability is shown below.

Test case number: A1.1
Feature being tested: Usable in all countries – regardless of which type of smart phone or tablet is used
How to Test:
1. Download the app on multiple devices using both IOS and Android.
   - How easy is this?

Very easy	1
Easy	2
Neither easy nor difficult	3
Difficult	4
Very difficult	5

   - How long does it take? ☐☐☐ minutes/ seconds*

   - How much space/memory does it use? _____KB/MB/GB*
     delete as appropriate

2. Once downloaded across multiple devices (ensure that screen sizes vary) and operating systems, compare the overall performance
   - Are the functions of the app the same across the operating systems and devices? (Yes/No)
   - Are the visuals similar enough to easily transfer to another platform? (Yes/No)

3. Compare the appearance of the app on different devices (with different sized screens).
   - Rate your user experience (based on small, medium and large screen size resolutions)

Very good	1
Good	2
Neither good nor bad	3
Bad	4
Very bad	5

   - Is one screen size more user-friendly than the others? (Y/N)
   - If Y, which one?

If a test case was deemed to have failed the issue was logged using CentERdata's project and issue management tool Redmine[6] and assigned to a programmer to fix. Features within Redmine also allowed fixes to be clustered by type and prioritised. Redmine also notifies users of updates and edits by email. This ensures that everyone was kept involved and informed of progress.

During this first testing period it became apparent that it would not be possible to implement some of the features identified in deliverable 3.6 during the DASISH period as these demanded far more development time and expertise than was available. This was due to the selection of the PhoneGap software package chosen to develop the app[7].

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[6] www.redmine.org
[7] PhoneGap was the software programme chosen to use to develop the app, however this is a more complex package, and the programmers had less experience in using it. It was still seen to be more efficient than using platform specific programmes, which would mean building an IOS version of the app separately to an Android version.

To ensure that a working prototype was available, essential features which were felt to be achievable were prioritised for the next stage of development. It was agreed that there were four key areas of possible development:

1. Extended and improved user interface (UI) features, including household and respondent selection, and data presentation
2. Better data storage and retrieval within the mobile application e.g. between the data models underlying the mobile application
3. Fully operational timed-out login and data accessibility for multiple interviewers from the server to the mobile application
4. Two-way synchronization between the mobile application and the central server as well as automatic synchronization triggered by the mobile application on launch or on closing the application

It was decided to focus on the User Interface (1) and the ability to add, edit and save information into the app (2), rather than the syncing and login functionality. The next stages of development and testing became more focused on de-bugging and refining the FMS, and making more focused adjustments to the tool based on the results of testing.

Subsequent testing phases were carried out remotely, over two shorter half day periods in June and July. The testing remained structured, and previously failed test cases were repeated.

3.3 Substantive features - contained within the FMS mobile application

The following functionalities are available in the prototype version of the mobile application:

- **Secure Login** – A username and password must be correctly entered to access the data contained within the FMS mobile application.
- **Clear overview of cases** – at the first screen, the app lists all cases that have been allocated to that interviewer and their current status. Each case is colour coded according to its status to help the interviewer easily identify its status.
- **Search function** – A search bar at the top of the screen allows interviewers to search for cases by ID number, name or address for quick access.
- **Saving a new address** – if a respondent has changed address, the new address can be recorded. There is also space to record whether this new address is still in the interviewer's catchment area, or if it needs to be reallocated to another interviewer.
- **Respondent / Household selection** – for countries where named samples are not available, the application facilitates both household and respondent selection using either the KISH or birthday method.
- **Recording contact attempts** – the app mirrors the ESS contact form structure, allowing interviewers to record each contact attempt and assign an outcome code, updating the status label and colour on the home screen.
- **Notes function** – This allows interviewers to record relevant information about the case or the respondent. Once saved, this information is easily accessible, and saved in chronological order.

- **Neighbourhood questionnaire** – the ESS also collects observable data about each address selected and the immediate surrounding area. These questions are also captured in the app.

Whilst the central server is less developed than the mobile application, some key features are already in place.
- **Data exchange and synchronisation** - The basic structure to allow for information exchange and syncing between the central server (database)
- **Data manipulation** - the mobile application has been established and administrative access to facilitate data manipulation is possible.
- **Assignment of unique identifiers -** The central server (database) also assigns universally unique identifiers to each case[8].

3.4 Features not tested

There were some features of the mobile application and central server that were completed, but were not possible to test as we were not able to recreate the scenario within a test case. These are detailed in Tables 1 and 2 in Appendix A.

4. The final prototype of the mobile application

Under the DASISH project, it has been possible to create a prototype 'demonstration' version of the mobile application.
To access the mobile application, please use Google Chrome to open the following web link: http://cdata21.uvt.nl/slimfms/

Whilst the mobile application can be downloaded on all mobile devices, for the purposes of this DASISH Deliverable, we have made the application available online.

To facilitate use by multiple parties, some features within the demonstration version of the app have been disabled. For example, all information entered by a user is deleted as soon as the browser window is closed. Therefore, each time a user clicks on the hyperlink above (to open the app) only case-level information is available.

To replicate the appearance of the application as if it were on a mobile device like a smartphone or tablet computer, we recommend manually altering the browser window.

One of the key functionalities of the mobile application is to allow interviewers to record the outcome of each contact attempt in a timely manner – ideally on the doorstep. Recording this on a mobile device also has the added benefit of allowing data to be exported back to the survey agency / central coordination in real time. The mobile application currently uses the existing ESS contact form structure to record outcome codes. It is possible that these outcome codes could be adapted in future versions to ensure compatibility with other survey's processes.

[8] Using 3NF normalization on data design by database modeling.

Below is a series of screen shots which demonstrate how the interviewer would navigate through the mobile application to record their contact attempt[9].

Example 1: Logging a successful contact attempt
One of the first screens gives an overview of all of the cases currently allocated to the interviewer. In this example, they are organised by area.

The overview also allows the interviewer to see the date of the last contact attempt

The colour coded system gives a simple overview of the status of the case

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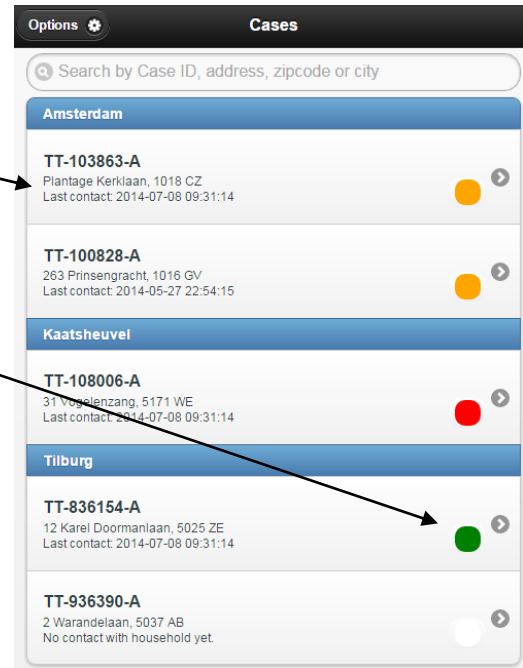
Once a case has been selected, the following screen is displayed:

The interviewer can then log a visit by selecting this

The next screen allows them to enter the date of the visit, and the method (either a personal visit, or a telephone call).

The interviewer will then be able to log the outcome of the visit (in this example, a completed interview).

Example 2: Selecting a household

In this example, the interviewer is working with an address based sample, and must select a household before they can log a visit. The next set of screen shots shows how they would do this using the mobile application.

Firstly, the interviewer should select the 'Respondent selection' tab.
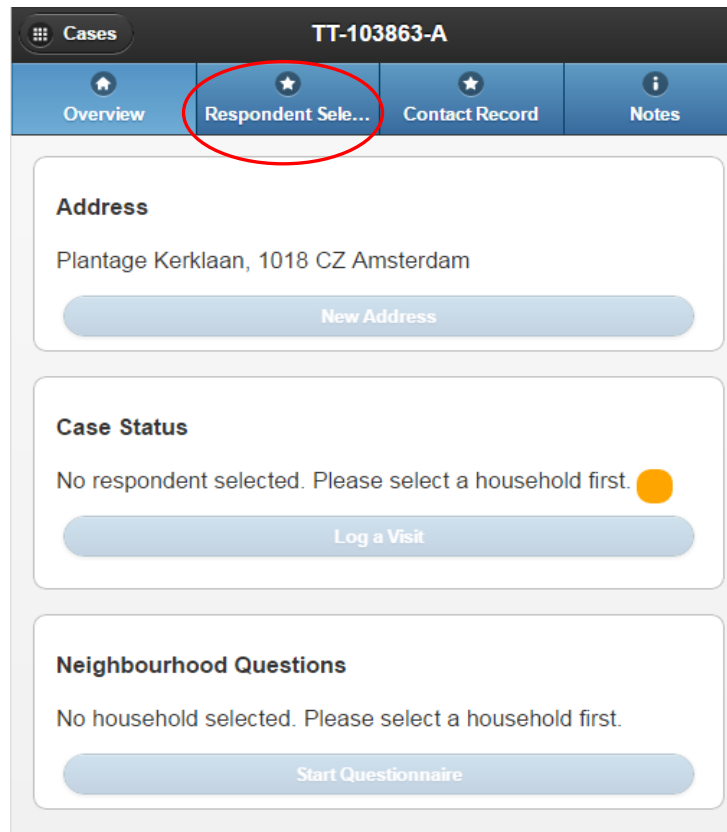
On this screen, the interviewer must enter the household numbers present at the address.

In this example, there are three flats (Flat A, Flat B, and Flat C).

Once entered, pressing the 'Save' button will prompt the selection of one of the households, using the KISH selection method.
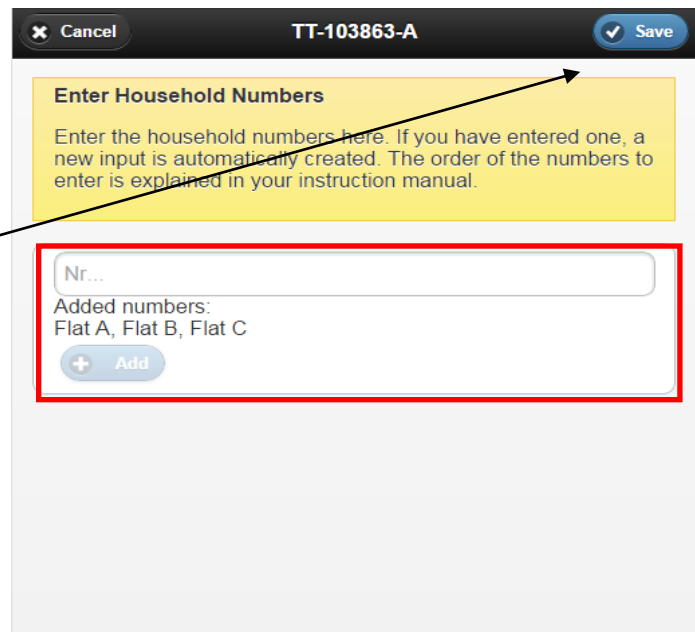
In this example, 'Flat A' was selected, and the address has been updated from 'Plantage Kerklaan, 1018 CZ Amsterdam'
to
'Flat A Plantage Kerklaan, 1018 CZ Amsterdam'
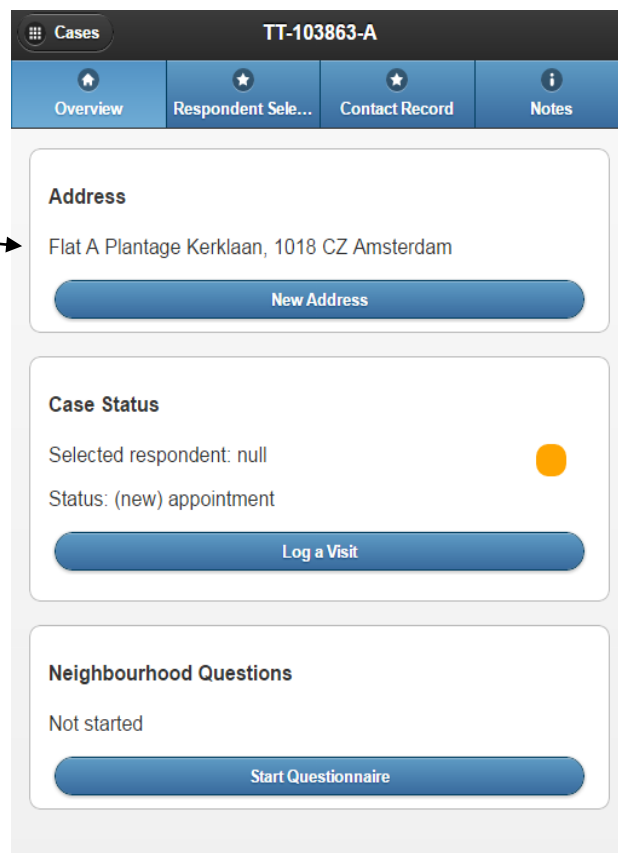
Example 3 Overview of contact attempts

In most instances, an interviewer will need to make multiple contact attempts at an address before securing a productive interview. The mobile application not only allows the interview to log each contact attempt, but also provides a simple overview, summarizing these visits. The screenshot below shows how this might look:

Contact attempts are ordered chronologically, with the most recent attempt first.

5. Future development work

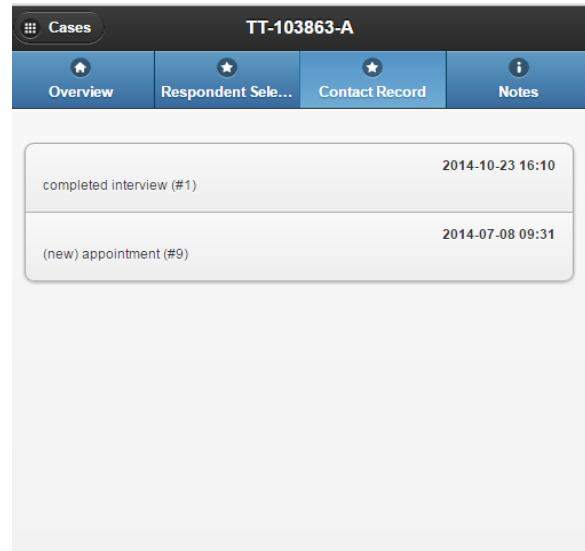We feel that the progress made so far to develop a standardised fieldwork management system (FMS) are a promising start for further research and development. Once complete, the FMS will enable interviewers to recode information on the door-step of the target respondent more easily than is currently possible in either CAPI administration on both the ESS and SHARE. Having an easy to use and portable system will help to ensure that all contact attempts can be accurately recorded as soon as they take place during fieldwork.

When finalized, the transfer of information from the FMS mobile application directly to the central database will facilitate comparable fieldwork monitoring in real-time. In addition, this will enhance the quality of paradata that is available during fieldwork and beyond. This also has the potential to aid the development of responsive designs to increase response rates and minimize non-response bias. This follows current literature which suggests that paradata should be used for fieldwork monitoring, as well as for nonresponse bias analysis.

5.1 The mobile application – features envisaged but not yet completed

There are a number of features in the mobile application that were foreseen in Deliverable 3.6 but that it has not yet been possible to fully implement / implement effectively. These can be found in Table1 in Appendix A.

5.2 The central server – features envisaged but not yet completed

Furthermore, additional work on the central server is needed to address the following features:

- **Tailored profiles –** The central server needs to be accessible to a number of different users with different data access permissions. Different access rights and viewing capabilities should be established for: survey agencies; central coordination teams; and national coordination teams.
- **Improved connectivity between the mobile application and the central server -** This is essential to allow for a complete flow of information. Synchronization to/from the mobile application to/from the central server would allow real-time updates to/from survey agencies. For the current prototype synchronization to the server was not activated.
- **Improved export / import functionality** – ideally, it should be possible to import, export and report data in standardised formats into or from the central database, aiding central fieldwork control, supervision and monitoring.

Further features that also need addressing can be found in Table2 in Appendix A.

5.3 Future development

As outlined above, we have developed a prototype version of the FMS under the DASISH project, but the tool is not fully operational yet. In addition to developing the features outlined in 3.6 but not yet completed, we believe there are other key areas which should be addressed before the FMS could be effectively 'rolled out' to countries participating in the ESS (in the first instance).

Additional features
Some additional features that were not originally proposed in Deliverable 3.6 but which could be beneficial to include in a future version of the FMS are:
- **Convert / translate the app into other languages** – both the mobile application and the central server have been built in English as this is the operational language of the ESS.
- **Interviewer statistics** – some survey agencies believe that interviewers can be motivated by regularly sending updates to them on their personal progress. If this was available in the mobile application, it could also motivate interviewers to use it in a timely way.
- **Built in checks within the mobile application** – to prevent user error checks could be programmed into the result section of the contact attempts which could prevent interviewers from recording incompatible combinations (such as recording additional contact attempts to cases with final outcomes).
- **Compatibility with additional national sample data** – Many countries obtain additional country specific data about their sample which they pass on to their interviewers. Ideally, it should be able to make this information available in the mobile application via the central server.

User Testing
So far, testing has primarily focused on the app and has been limited to in-house testing at CentERdata and by ESS researchers. Any new prototype of the application or the FMS as a whole would benefit by gaining the perspective of the end users e.g. survey interviewers and operational staff at a survey agency.

Pilot study
After completing user testing, there would be additional benefits to be gained by implementing a small scale pilot to test the FMS in real time. It is foreseen that this would detect any additional problems that would not necessarily arise during user testing.

Scoping barriers to implementation
In order for the FMS to be used most efficiently and effectively, a scoping exercise should be conducted. This would explore potential difficulties associated with implementing such a tool on both centralised surveys like SHARE and de-centralised surveys like the ESS. For de-centralised surveys in particular, there may be difficulties associated with the transfer of information across countries. Therefore, a scoping study could seek to explore potential legal restrictions concerning data protection, security, ownership, transfer and storage. There might also be difficulties with costs associated with the availability of mobile technology as well as staffing and expertise for maintenance of the application and server centrally and nationally.

6. Discussion and Summary

This report has aimed to document the development of the prototype FMS in the 12 months since the completion of Deliverable 3.6. The FMS will consist of a central server and an application for smart phones and small tablet computers. The development of the FMS is part of the collaboration between ESS and SHARE to enhance survey instruments for cross-national fieldwork in Europe, to combine acquired knowledge for developments which have relevance beyond their own survey work, and in the end to increase survey quality by having more standardised approaches, based on mutual efforts.

Appendix A: Table 1 Features – FMS mobile application[10]
Features are grouped into four broad categories: Usability, Security, Data transfer and Fieldwork processes

Group	Feature	Essential or optional	Available in prototype	Comments / observations
Usability	Simple and easy to start, use and navigate through	Essential	Yes	N/A
	Usable in all countries – regardless of which type of smart phone or tablet is used	Essential	Yes	The FMS mobile application was built using PhoneGap, making it compatible with all mobile device operating systems.
	Compatible with system(s) currently used by fieldwork organisations	Essential	No	We have been unable to test this feature. Future work would be needed to scope the system(s) used by survey agencies, and how these could communicate with the FMS.
	Suitable for all interviewers – regardless of whether using PAPI or CAPI administration for the main survey interview	Essential	Yes	N/A
	Compatible with samples of address, household and named individuals	Essential	Yes	For address and household based samples, the respondent is prompted to carry out a household and respondent selection. Ideally, this feature would be enabled / disabled based on the sample type.
Security	Password protected secure log-in for interviewers; no capacity for the application to 'remember' a password	Essential	Yes	The correct username and password must be entered to log in to the mobile application. The prototype version currently 'remembers' the password to facilitate testing – but this feature could be disabled in future versions.
	User timed-out of the application after a defined period of time	Essential	No	This was not implemented in the current prototype
	Name and address of target respondent only visible to the fieldwork organisation and	Essential	No	We have been unable to test this, as the mobile application has only been tested

[10] As listed in Deliverable 3.6

Group	Feature	Essential or optional	Available in prototype	Comments / observations
	interviewer within each country			using a single user ID.
Data transfer	Allow for any new data from the fieldwork organisation to be transferred via the central server to the mobile applications, updating or replacing information previously stored in the mobile application	Essential	No	It was not possible to test this as we were unable to replicate the data transfer process from the fieldwork organisation to the central database.
	Automatic and simultaneous transfer to fieldwork organisation and to central server as soon as the application is closed by an interviewer	Essential	No	Unable to test this, as we were unable to replicate a fieldwork agency server.
	Transfers of information via internet connection using Wi-Fi and via mobile phone networks[11]	Essential	Yes	Only tested using Wi-Fi. Connectivity with the central server was established using generic web protocols.
	Secure transfer to/from central server and to/from fieldwork organisation	Essential	Yes	Data is transferred via secure headers and https protocol.
	Offer the possibility of transferring information on a frequent basis	Essential	No	It was not possible to fully implement this. The mobile application connects with the central database each time the user logs in, but not thereafter.
Fieldwork processes	Assign a unique reference identifier to each case	Essential	Yes	Each case can be individually identified (using 3NF normalization data structuring). Any edited data parts are inserted as new data objects.
	Summary overview to instantly identify the status of a case	Essential	Yes	The overview screen provides a simple view of all cases and their current status. Colour coding and a search function also help the interviewer to navigate through the cases.
	Colour coding to determine the status of a	Essential	Yes	A colour coding system has been

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[11] Connectivity is key for the full functionality of the mobile application to be assured. The application may start and run on a device without internet access but it will stop working as soon as a login or synchronisation is required.

Group	Feature	Essential or optional	Available in prototype	Comments / observations
	case – based on the outcome code assigned			implemented, however we feel it could be further improved by simplifying the number of colours used. We think a three-colour 'traffic-light' coding system would be best.
	Filters to manage cases using the overview summary lists	Optional	Yes	A search filter was implemented for 'free text' searches across a number of fields including names, addresses and cities.
	Possibility to select individual cases and to record/track their status throughout fieldwork	Essential	Yes	Cases can be selected individually and viewed and edited accordingly by the interviewer from the mobile application.
	Installation of a KISH grid and last/next birthday questions (to select respondents)	Essential	Yes	This is triggered / forced when applicable.
	Log visit information and contact attempts	Essential	Yes	Each visit can be logged, and a summary screen is available within each case. It is not currently possible to record the date and time of the visit; however contact attempts are time stamped within the app. Therefore there would only be a discrepancy if the contact attempt was not logged immediately.
	Exact replication of structure / format of ESS contact forms	Optional	Yes	Most of the information captured by the ESS contact form can be captured by the mobile application, with the exception of a question on the likelihood of future cooperation and the provision of open text boxes in the application (as in the contact form).
	Record outcome codes for contact attempts	Essential	Yes	The mobile application allows the interviewer to record the outcome of each contact attempt.
	Log to record the status of an invalid outcome address	Essential	Yes	If recording that the case has invalid outcome address, the interviewer is then

Group	Feature	Essential or optional	Available in prototype	Comments / observations
				prompted to record a reason.
	Log to record the reasons for a refusal	Essential	Yes	When a refusal is recorded, the interviewer is also prompted to record the reason for refusal.
	Log to record likelihood of cooperation in future	Essential	No	This was not implemented as it was deemed too complex to be addressed during final refinements
	Space to record new address if respondent has moved (only visible to the fieldwork organisation and the interviewer within each country)	Essential	Yes	The mobile application allows for a new address to be entered and for the interviewer to state whether this new address remains in their area. Any new address details do not overwrite the original address stored at the central database.
	Log to record answers to neighbourhood questions	Essential	Yes	All neighbourhood questions contained in the ESS contact forms have been added to the mobile application, and can only be completed once.
	Note making facility (for interviewers to make notes for themselves)	Optional	Yes	Notes can be added at the individual case level, and a summary of all notes can be seen.
	Ability to send messages to fieldwork organisation	Optional	No	It was not possible to implement SMS / email services for this prototype.
	Include a calendar to help interviewers organise their workload	Optional	No	It was not possible to implement calendar services for this prototype.
	A map or travel distance indication feature to help interviewers manage cases e.g. by location of respondent	Optional	No	It was not possible to implement map services for this prototype.
	GPS of interviewer	Optional	No	This was tested separately and is operational in the mobile application framework; however it has not been integrated in prototype mobile application.

Appendix A: Table 2 Features – FMS central server[12]

Features are grouped into five broad categories: Usability, Security, Data transfer, Fieldwork processes and Outputs

Group	Feature	Essential or optional	Available in prototype FMS	Comments
Usability	Compatible with system(s) currently used by fieldwork organisations	Essential	Unknown	Import functionalities have been implemented, but it has not been possible to check if these are compatible with the system(s) used by all fieldwork organisations.
	Compatible with a range of CAPI programs	Optional[13]	No	We have been unable to test this feature. Future work would be needed to scope the CAPI system(s) used by survey agencies, and how these could communicate with the FMS.
	Compatible with samples of address, household and named individuals	Essential	Unknown	It was not possible to test this. 'Dummy' sample files would need to be created at the household, address and named individual level to fully test this. However the mobile application does have the functionality to perform respondent selection for both household and address based samples.
	Name and address of target respondent only visible to the fieldwork organisation and interviewer within each country	Essential	No	It was not possible to implement this at the central database level in the time period.

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[12] As listed in Deliverable 3.6

[13] Whilst the central server does not need to be compatible with a range of CAPI programs, the fieldwork servers will need to be able to ensure that they can upload information to the central server. The fieldwork organisation needs to be able to import/export data from their server in a computer readable format (for example via CSV, XML or JSON) before they can upload information to the central server. The central server can be expanded as required to include additional imports to match the exports of third parties.

Group	Feature	Essential or optional	Available in prototype FMS	Comments
	Provide options for 'hiding' information from users based on 'flags' e.g. data from previous round / respondent details only visible to users within a country	Essential	No	It was not possible to implement this at the central database level in the time period.
Security	Provide secure access to members of the CST (to data from all countries) via password protected log-in	Essential	No	It was not possible to test this, as there was not sufficient time to set up separate accounts and permissions. There is only a single user account created for the central database.
	Provide secure access to the NCs (restricted to data from their own country) via password protected log-in	Essential	No	See above
	Secure storage of anonymised data files	Essential	Yes	There are data storage protocols for the central server that facilitate this.
Data transfer	Facilitate secure transfer from/to mobile application and from/to central server at fieldwork organisation	Essential	No	It was not possible to implement this at the central database level in the time period.
	Offer the possibility of transferring information to/from mobile application and to/from fieldwork organisation on a frequent basis	Essential	No	It was not possible to implement this at the central database level in the time period
Fieldwork processes	Assign a unique reference identifier to each case	Essential	Yes	Each case can be individually identified (using 3NF normalization data structuring). Any edited data parts are inserted as new data objects.
	Handle multiple as well as single stages of case allocation to interviewers	Essential	No	It was not possible to test this feature. 'Dummy' cases were allocated from the central database to a single account on the mobile application in one stage for testing.
	The interfaces at either the central or the	Essential	No	It was not possible to test this, as we would

Group	Feature	Essential or optional	Available in prototype FMS	Comments
	fieldwork servers should allow respondents to be reassigned according to their data/values to new interviewers (e.g. if respondents move house)			have needed multiple user accounts set up on the mobile application.
Outputs	Create output files based on needs of the user	Essential	No	It was not possible to implement this at the central database level in the time period
	Provide output files in a user-friendly, standardised format (e.g. Excel and/or SPSS)	Essential	Yes	It is possible to export data from the central database into Excel.
	Order output files (for each country and interviewer) chronologically according to when the outcome code was recorded in the mobile application	Essential	Yes	It is possible to export data in an ordered format from the central database into Excel.