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This deliverable provides guidelines for executing the pilot trials of the CaMeLi project. We define 'Piloting' as the implementation of the technology developed in the scope of the project, on a small controlled scale to allow for its full impact, benefits and weaknesses to be evaluated before implementation of a full-scale deployment. It describes the setup of the pilot studies including the constraints, technological issues and the organization.

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1 Introduction

1.1 Summary

The objective of this document is to provide guidelines for executing the pilot trials of the CaMeLi project. We define 'Piloting' as the implementation of the technology developed in the scope of the project, on a small controlled scale to allow for its full impact, benefits and weaknesses to be evaluated before implementation of a full-scale deployment.

1.2 Structure of this Document

The document starts with the description of the pilot trials from a non-technical perspective in Chapter 2 and a technical perspective in Chapter 3.

1.3 Relationships with other Deliverables

This deliverable provides guidelines for executing the pilot trials defined in D5.1.

1.4 Contributors

Table 1: Revision History

Version	Date	Reason	Revised by
V1	18-02-2014	Initial version	Rachelle Wintjens, Orbis
V2		Updated Version	Christiana Tsiourti, Unige
V3	11-04-2014	Updated Version	Nico van der Aa, Noldus
V3	17-06-2014	Pre-Final Version	Nico van der Aa, Noldus
V4	30-06-2014	Final Version	Nico van der Aa, Noldus & Rachelle Wintjens, Orbis
V5	28-07-2014	Reviewed Version	Ginger Claassen, SAG & Nico van der Aa, Noldus

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2 Description of Pilot Trials (Non-Technical Perspective)

The pilot trials of the CaMeLi project are executed in parallel in the elderly home (Orbis Hoogstaete) and care apartments (Silverstaete, Greenpark and Springfield) of Orbis in the Netherlands and in the private homes of members of VIVA in Switzerland. The execution is based on a sequence of incremental phases to demonstrate how the system is being developed, tested and improved as well as extended, in a tight collaborative program between end-users and technical partners. Based on the outcomes of the pilot trials, initial assumptions can be adjusted and informed decisions can be taken with regard to the deployment of the system on a larger scale after the end of the CaMeLi project.

2.1 Pilot Trial Plan for VIVA (Switzerland) and Orbis (The Netherlands)

In general the trials are planned for both, VIVA and Orbis, according to the following timeframe:

- **First pre-trial in month 8**

The first pre-trial in month 8 consisted of a video shown to the elderly. This video showed different options regarding colours, screens (including agenda), moving avatars, etc. to find out how the elderly feel about these first ideas. We ask both elderly groups of VIVA and Orbis for their feedback, to be able to achieve a greater acceptance from the users. The first pre-trial was planned in March, which is month 10. We chose to postpone the pre-trial to be sure we had some nice mock-ups and images in the video to show the elderly and receive good feedback from them for further development. The video shall be ready mid of March thus VIVA and Orbis can provide their feedback to the technical partners by end of March. After the feedback, adjustments can be made for further development of the CaMeLi system in line with the end-user needs. The participants' reactions will be recorded by a standardized protocol shared by both VIVA and Orbis.

- **Second pre-trials (M16) and final trials (M 18-24)**

The second pre-trials and the final trials will be described in the following versions (b and c) of this deliverable.

- **Pre-trials user acceptance per testbed in month 16 (Task 5.2.)**

In month 16, 7 selected users from VIVA and 7 from Orbis will test the look and feel of the latest prototype. This prototype builds upon the first prototype from month 8 in which the feedback from the first pre-trial is processed. The goals of a second test on look and feel will provide us with high quality feedback indicators and a greater acceptance by the users. The same method as before will be used to assess the acceptance of the system.

- **Trials in month 18 lasting for six months till month 24 (Task 5.3)**

These trials will include 10 elderly from Orbis in assisted living complex and 10 elderly from Orbis living in apartment complexes. Furthermore, 20 elderly from VIVA will participate. These elderly will be living independently at their own private homes. The participants will benefit from individual assistance and training, based on their specific needs.

2.2 End-User Recruitment and Inclusion Criteria

2.2.1 *Elderly Target Group*

The target-group of the trials is defined with regard to the project proposal. Specifically, the elderly in the trials are a big group of healthy elderly or with light physical or mental health problems who live independently and alone at home and can find pleasure and relief in getting help or stimulation to carry out their daily activities.

All the participants of the trials are recruited voluntarily based on the following inclusion criteria:

- Indication of interest in the project
- Belonging to the “*young old*” (over 65) or “*older old*” age groups (over 80)
- Living alone in independent homes or in assisted living facilities
- Being healthy and active (physically, mentally and socially) at the time of the study
- Be able to take glasses off when necessary for the system as glasses might deteriorate the facial expression analysis software performance
- Not use a wheelchair inside the home as this would interfere with the setup of the devices

The elderly participants in the trials will be categorized according to their ICT skills, age, gender, profession, nationality (according to the criteria in T5.2). For each elderly participant in Orbis, a care community network (4 persons) will be build. The network can include family, neighbour, friends, formal and informal caregivers.

2.2.2 *Care Professionals and Experts*

Care professionals, including occupational therapists, care coordinators and qualified caregivers interacting with older adults on a daily basis in an assisted living facility in the Netherlands will participate in the trials. Their expertise about the elderly will be used in the process of user needs analysis up to the actual trials. Furthermore they will be part of the care community network of the elderly, recruit the elderly and train the elderly in using the system.

Additionally, two specialists in neuropsychology and gerontopsychology, members of VIVA association will be involved; in addition to their help with designing the Memory Club services, their expertise will be used for the user recruitment within the local community and for helping with the learning of the use of the system. There will also be a local help service, with weekly meetings.

2.2.3 *Informal Caregivers*

For the trials in Orbis and VIVA the aim is to include at least one informal caregiver for each of the participating clients (i.e., children, grandchildren, friends, siblings, volunteers).

The key characteristics of participants of the first pre-trial are summarized in

Table 3.

Table 3: Description of participants

Characteristics	The Netherlands Assisted Living Complex		Switzerland Independent Living
	Older Adults		
Age Range	71-93		65-81
Living Environment	Elderly home	Care apartments	Independent household
Total participants	4	2	6
Gender:			
Male	1	0	2
Female	3	2	4
Social status:			
Widowed/Divorced	4	2	5
Living with spouse	-	-	1
Care requirements	Daily support	Frequent support	Occasional support
Special aid:			
Hearing aid	1	0	0
Glasses	4	2	3
Walker Wheelchair	2	-	-
Medication	2	2	-We do not ask
Special diet	4		-We do not ask
Experience with technology	Low-Medium	Medium-High	Low-Medium
Formal Caregivers and Psychologists			
Total Participants	2	3	6
Expertise	Occupational therapist Care coordinator		2 Neuropsychologists 4 Gerontopsychologists
Working Environment	Nursing home	Care apartments	Local elderly association

3 Technical Description of the Pilot Setup

In this section we describe how the two trial sites of the project are organized from a technical perspective and address issues related to the setup and execution of the pilot.

3.1 Pre-analysis of Pilot Setup

In this Section we present an analysis of the infrastructure that is in place in the two trial sites and discuss the execution of required adaptations, if necessary and whenever possible (i.e. room layout, specific furniture, internet provision *etc.*).

To facilitate the technological development of the prototype and to setup initial pilots, Noldus IT made pre-video recordings of each targeted room at Orbis Hoogstaete (elderly home) and Orbis care apartments. Four different apartments have been examined with the Kinect camera to see if this type of sensor would be applicable.

- *Orbis Hoogstaete (elderly home)*

The main conclusions that have an effect on the pilots are:

- The rooms are small: the living room is only 12 m². Since every camera type has a limited field of view, this implicitly indicates we cannot capture all events in the room by only a single camera. Especially the tasks in WP2 should focus on hot spots which are identified in WP1 (e.g. the television area).
- The kitchen is very small and the kitchen sink is against the wall. If the person is behind the sink, no camera is able to determine what he or she is doing. Also the illumination in the kitchen will be dark. For the initial pilots, the kitchen will be excluded.

- *Orbis care apartments*

The apartments at Orbis (Silverstaete, Greenpark and Springfield) have more space and an open kitchen, which gives more room for capturing the elderly when they actually move around in their apartment. These apartments have many windows, which gives some challenges due to the changing illumination conditions. However, as long as we do not point the Kinect towards the windows, the quality of the depth and coloured images are sufficient.

Additionally to the Kinect recordings, some initial tests are performed using Noldus FaceReader on the elderly participating in the CaMeLi project to see if it is possible in the first place. These tests showed the FaceReader tool is capable of recognizing emotions from facial expressions of elderly, including some elderly wearing glasses.

As the pre-trial in M8 is limited to showing videos, the technical aspect of the pilot setup is limited to setting up a screen and a PC that shows the movies.

Orbis Hoogstaete is fully equipped with WIFI in the elderly house and small scale living. On the other hand, clients from the apartment blocks have their own WIFI or (in case they do not) need to be provided by the project.

- *Apartments of VIVA clients (Switzerland)*

The technical architecture the VIVA pilot site will be similar to the Orbis set up. This is especially true for the basic standalone system that will be installed in the volunteer's apartment. However, VIVA will recruit from people who are living independently in their own apartments. This heterogeneous living environment, high variability in furnishing and floor plan configurations, and needs of this population means that the pilot set up will differ in many respects from the Orbis population. Most of the participants of VIVA, especially when they are single, live in small (2 bedroom) apartments.

The elderly live in their own homes thus from a technical perspective some of them have their own WIFI, some of them do not. Internet connection should be provided by the project.

3.2 Material Matters and Set-Up

In order to perform the pilot trials, specific hardware equipment and software has to be purchased, installed and configured in the living environment of the end-users. Details about the “Exit Strategy” with regard to the CaMeLi software and hardware equipment after the end of the trials are discussed in Section 3.4.3 of this document.

3.2.1 Hardware Equipment

The following hardware equipment will be procured with an appropriate warranty.

Table 4: Hardware equipment specifications for tablet device.

Tablet device	
Technical Description	<ul style="list-style-type: none"> • Lenovo Think Centre Edge 93z All-in-One • Core i5 • Multitouch 21.5in screen • Dedicated graphics card • Windows 8
Estimated Cost	~1100CHF / ~900EUR
Utility	To be used as the main device for interaction with the user, processing sensor inputs, and communicating with any external servers.
Setup	<ul style="list-style-type: none"> • VESA wall mount (see below) or standard table stand. • Placed in an easily accessible area at eyelevel height. • Initially one device per user in the living room or room that the user spends most of the time in or would require most support in. In the future there can be additional tablets if necessary to cover the user’s needs. For example if the user spends equal time in two different rooms or the apartment/house is too large to be sufficiently serviced by a single device.

Table 5: Hardware equipment specifications for for wall mount.

VESA MIS-D wall mount	
Technical Description	<ul style="list-style-type: none"> • Supports: <ul style="list-style-type: none"> ○ 12-22.9” screens ○ <14kg ○ Hole patterns: 75mm x 75mm and 100mm x 100m
Estimated Cost	~ 70CHF/~ 50 EUR
Utility	To mount the tablet device on a wall

Setup	Screwed directly to the wall
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Table 6: Hardware equipment specifications for sensor.

Microsoft Kinect sensor for Windows	
Technical Description	<ul style="list-style-type: none"> • Viewing angle: 43° vertical by 57° horizontal field of view • Setting 1 ranges: <ul style="list-style-type: none"> ○ Optimal: 0.8m-4m ○ Non-optimal: 0.4m-0.8m, 4m-8m ○ Inoperable: <0.4m, >8m • Setting 2 ranges : <ul style="list-style-type: none"> ○ Optimal : 0.4m-3m ○ Non-optimal : 3m-8m ○ Inoperable : <0.4m, >8m
Estimated Cost	~300CHF/~ 230 EUR
Utility	3D sensor and image sensor to be used for tracking the user's movements, pose, state. Essential for fall detection, gaze tracking, and object detection.
Setup	<ul style="list-style-type: none"> • Small screws on wall, or removable heavy duty sticky pads. • Placed in spot with the best viewing range. • One Kinect per tablet device.

3.2.2 Software

Table 7: Software specification for operating system.

Windows 8 Operating System	
Estimated Cost	Included in the tablet price
Utility	Main operating system
Setup	Already installed on the system upon purchase

Table 8: Software specification for the CaMeLi main application.

CaMeLi Main Application and Accompanying Dependencies	
Estimated Cost	Provided by all technical partners
Utility	Main application that interacts with the user
Setup	To be installed on each tablet device

3.2.3 Requirements for Installation in the User's Home

- Over all system requirements

The Kinect sensor works best in the range of 0.8 – 4.0 m. Since the sensor uses infrared light, interference with direct sunlight should be avoided and therefore the sensor should never be directed towards a window. If multiple Kinect sensors are placed in one room, the area the sensors capture should not overlap too much as they are active sensors and their transmitted light pattern will interfere. As the main goal of the CaMeLi system is to interact naturally with the person, the Kinect should be placed just above the screen as the person will be directed towards the screen.

The system will be available in two versions: A standalone “offline” version and an “online” version that requires the (main) tablet to be connected to the internet. In the second case, if internet access is not provided in the home of the user, this will have to be setup during the trial setup.

- Orbis Hoogstaete, the Netherlands

Orbis Hoogstaete is fully equipped with WIFI in the elderly house and small scale living. Clients from the apartment blocks have, if necessary their own WIFI or need to be provided with by the project.

If we mount on a wall we need to repair this after the project, especially for the care apartments because these are private apartments. Thus Orbis prefers to use a stand as much as possible.

- VIVA (Switzerland)

In VIVA the participants are most often not owners of their apartments, thus they may be reluctant to drill their walls to mount the hardware of the system. Therefore, specially designed stands will be used for mounting the tablets and the Kinect devices.

3.2.4 Hardware Set-Up and Software Configuration

For both Orbis and VIVA, the main software components on the tablet device will be installed and verified by the supporting technical partners (Noldus and UniGe respectively) prior to the all-in-one pc being installed in the user's home.

In the facilities of Orbis the hardware set-up will be performed internally by the technical support department. For VIVA the set-up will be undertaken by UniGe. If necessary, an external technician will be subcontracted to mount additional equipment in the apartments of the users.

Once the tablet is installed in the user's home, additional software setup will be required: the profile of the user is linked to the device, any personalized settings that the user may require (language, avatar model, etc.) will be entered, and the appropriate settings for any communication to external databases or other devices. The setup will be performed by the supporting technical partners or by trained professionals working in the trial sites.

3.3 Project Presentation and User Training

Informative presentations with all the people directly and indirectly involved in the pilot trials (i.e., elderly, caregivers and informal caregivers) will take place to clarify the objectives of the pilot, how long it will last, the privacy issues as mentioned in D5.2a and the implications for the end of the pilot as well as the responsibilities of the involved members. Issues about privacy as mentioned in D5.2a are shared.

It is particularly important to explain carefully to participants how crucial it is to record the failures and problems they might experience, as well as the successes. It should be emphasized that not only the positive results are desired and the participants will be encouraged to report problems that they find in order to avoid producing an artificially “successful” pilot.

All the participants will be trained to use the specific tools prior to the beginning of the trials. The training will describe the steps to be taken when they find errors or problems, making it clear that it is not their fault, and provide tools to report both positive and negative results.

At Orbis, there will first be a training of the professionals. Then, the elderly will be trained by a global presentation of the system followed by training in small groups during the whole trial and individual appointments. Also the elderly have the possibility to ask the caregiver their questions individually on a daily base.

At VIVA, there will first be a training of the professionals –as they were involved in all the precedent steps of the system’s development, it should not take much time. Then, there will be a few sessions of global presentation of the system, so that all the participants will be able to attend one of them, and individual appointments will be made according to the user’s needs (some of the participants will have no experience at all, while some others are already proficient with a computer), at their place.

The technical partners, Noldus for Orbis and UniGe for VIVA respectively, will participate in the training process, mainly for training the professionals and answering any technical questions which may arise during the training sessions.

3.4 Pilot Execution and Support

Once the pilot is running, a monitoring plan will be activated and executed by two teams which will be created in the sites to ensure a smooth operation.

3.4.1 Pilot Teams

- Orbis Hoogstaete, the Netherlands

Orbis- Maarten Coolen and Romy Schurgers will organize the meetings and individual support and along with other trained caregivers they will provide the different training sessions.

Noldus - Nico van der Aa will provide technical support during the setup and execution of the trials.

- VIVA (Switzerland)

VIVA – Anne-Claude Juillerat Van der Linden and Emilie Joly will organize the global meetings and the individual appointments, and, along with other trained psychologists of the team, will provide the individual trainings at home.

UniGe – Marios Fanourakis will provide technical support during the setup and execution of the trials.

3.4.2 Technical Support

- During the execution of the trials the two sites will need support, probably a lot initially and less as they get more used to handling problems themselves locally. The technical partners will work together with the end-user partners to generate “Self-assisted guides”, manuals that explain the

maintenance and solutions to common problems like how to connect/reconnect equipment. Special attention will be given to use plain language that the elderly will be able to comprehend. Additionally, technical support will be provided on a call-out basis as required by UniGe for VIVA and Noldus for Orbis. Other project partners will only provide support if requested by UniGe or Noldus and it is absolutely required to perform the trials.

3.4.3 *Exit Strategy and End of Pilot*

During the execution of the pilot several indicators will be measured and data collected and analysed to allow for the verification and validation of the original ideas proposed by the project. According to the planning, at the end of a determined period, if the data gathered is considered sufficient for analysis then the pilot is terminated.

Our exit strategy with regard to hardware equipment considers two alternatives:

- An end-user wishes to stop pilot testing in the middle of the process; it is possible for the participant to stop or skip their participation in any given test without any consequence neither for the participant nor the overall quality of the results, since each component of the user data can be erased if required. If this situation occurs, the participant will be given the choice to either maintain or erase data relative to his/her tests.
- An end-user becomes strongly reliant on the developed system and cannot stop using the solution. If the user dependency comes from the high added value of the CaMeLi solution and reflects the success of the project as a whole, it will be possible for the testers to keep the solution. In this case decisions about support and maintenance have to be made between the end-user and technical partners.

The participants of VIVA will be able to keep all the hardware equipment after the end of the trials without any additional cost. For the case of Orbis the initial assumption is that all the equipment will be removed from the homes of the end-users at the end of the pilot trials. However a final decision concerning retention of the equipment will be taken at the end of the pilot trials.

The CaMeLi system will not record any information about the users. However, during the pilot trials, a personal profile will be generated for each user and it is possible that specific data will be collected and analysed in order to validate and improve the developed components (i.e., behaviour analysis and emotion recognition algorithms). At the moment, our exit strategy with regard to personal data considers two alternatives:

- Data collected during the operation of the pilot will be kept for a predetermined period for processing in case of potential further development. It may be useful to access data which may not have been treated before.
- Immediately after the end of the pilot all the data will be destroyed.

All the information concerning the use and retention of hardware equipment, access to the system and retention of personal data during and after the pilot trials will be carefully explained to the potential end-users and will be included in the informed consent forms signed prior of the beginning of the trials.

4 Conclusion

Pilots are executed to provide evidence of how the technologies developed by the project perform in different real-life situations. To prepare for the pilot trials, this document provides the guidelines with a focus on the early pilots defined for month 8. From a non-technical perspective, it describes the plan of each trial and pilot for VIVA (Switzerland) and Orbis (The Netherlands), including details of how participants (elderly, care professionals, experts and informal caregivers) are recruited. From a technical point of view, it describes the environment of the setup and its technological challenges, the hardware and software used in the trials including the requirements for installation, the way the user is trained and how the support is arranged during the trials. With these guidelines, the trials can be setup similarly at the two testbeds.

The next versions of this deliverable will include more detailed description of the later pilots in M16 and M24 as lessons learnt in the first pilot studies can improve the setup and execution of later pilots.

5 Glossary

Table 9: List of terms, abbreviations and acronyms

ICT	Information and Communication Technology
WIFI	Wireless network