Project Identification	
Project number	No. 611421
Duration	1st Dec 2013 – 30th Nov 2016
Coordinator	Andreas Hochgatterer
Coordinator Organisation	AIT Austrian Institute of Technology GmbH, Austria
Website	www.miraculous-life.eu

Miraculous-Life

Miraculous-Life for Elderly Independent Living

Document Identification	
Deliverable ID:	D6.1 Trials Specification and Design
Release number/date	V2.0/27.08.2014
Checked and released by	Christophoros Christophorou, (CITARD)
Work Status	Select one: Not Started, Work in Progress, Finalizing, Finished
Review Status	Select one: Not reviewed, In Review, Request for changes, Accepted

Key Information from "Description of Work"	
Deliverable Description	The main objective of this deliverable is to provide the initial trials setup and design and examine issues like how the trial sites will be organized, what kind of training will be needed, how the evaluation data will be collected and define the user groups that will participate in the trials. Also, an inventory of the available resources and a specification of what needs to be added, extended or adapted for the support of the proposed pilots, is made. In addition, the overall evaluation approach that will be used both for the pre-trials' and the trials' evaluation, is defined in detail.
Dissemination Level	Select one: CO=Confidential (Consortium Members + Commission) PU=Public
Deliverable Type	Select one: R = Report P = Prototype D = Demonstrator O = Other
Original due date	Project Month 8 / 31 July 2014

Authorship& Reviewer Information	
Editor	Christophoros Christophorou / CITARD
Partners contributing	CITARD: Christoforos Panayiotou, Christophoros Christophorou, Eleni Christodoulou, Pedro Trindade ORBIS: Cindy Wings, Maarten Coolen, Rachelle Wintjens MRPS: Donato Cereghetti
Reviewed by	Andreas Hochgatterer (AIT)

Release History

Release Number	Date	Author(s)	Release description /changes mad
V0.1	10.01.2014	CC/CITARD, EC/CITARD	First draft – First version of Table of Contents
V0.2	17.02.2014	CC/CITARD, EC/CITARD, PT/CITARD, DC/MRPS, CW/ORBIS	Updates on the Table of Contents
V0.3	24.02.2014	CC/CITARD, DC/MRPS, CW/ORBIS	Finalization of Table of Contents
V1.0	02.05.2014	CC/CITARD, EC/CITARD, PD/CITARD	First Version of contributions for chapter 1 and sections 4.2, 4.3 and 4.4 for the evaluation methodology.
V1.1	11.07.2014	CP/ CITARD, CC/CITARD, EC/CITARD, CW/ORBIS, MC/ORBIS, RW/ORBIS, DC/MRPS	Minor updates on the ToC, and First Version of contributions for chapter 2, chapter 3. Updates in chapter 4. Preparation of evaluation questionnaire.
V1.2	25.07.2014	DC/MRPS, CW/ORBIS, RW/ORBIS, MC/ORBIS	Updates for chapter 2 and chapter 3.
V1.3	25.07.2014	CP/CITARD, CC/CITARD, EC/CITARD, PT/ CITARD, MC/ORBIS, RW/ORBIS, DC/MRPS	Modifications in chapter 4 and enhancements on the evaluation questionnaire.
V1.4	29.07.2014	CP/CITARD, CC/CITARD, DC/MRPS, MC/ORBIS, RW/ORBIS	Updates in the evaluation methodology that will be used for the pre-trials and the trials.
V1.5	12.08.2014	CP/CITARD, CC/CITARD, DC/MRPS, MC/ORBIS, RW/ORBIS	Updates on the evaluation questionnaires.
V1.6	21.08.2014	CP/CITARD, CC/CITARD, DC/MRPS, MC/ORBIS, RW/ORBIS	Finalization of evaluation questionnaires and updates on the main content.
V1.7	22.08.2014	CC/CITARD	Finalization of first complete version of the deliverable and provision to the assigned reviewer for review.
V1.8	25.08.2014	AH/AIT	Final Review, comments added – can be released after minor changes
V1.9	26.08.2014	CP/CITARD, CC/CITARD, DC/MRPS, MC/ORBIS, RW/ORBIS	Contributions received from all partners addressing the comments of the reviewer.
V2.0	27.08.2014	CC/CITARD	Final version of D6.1.

Miraculous-Life Consortium

Miraculous-Life (Contract No. 611421) is a project within the 7th Framework Programme. The consortium members are:

Contact person:	Andreas Hochgatterer
Email:	andreas.hochgatterer@ait.ac.at
Partner 1	***AIT AUSTRIAN INSTITUTE OF TECHNOLOGY GMBH (AIT, Project Coordinator, AT)***
Contact person:	Dimitri Konstantas
Email:	dimitri.konstantas@unige.ch
Partner 2:	***UNIVERSITY OF GENEVA (UniGe, CH)***
Contact person:	Prof. George Samaras
Email:	cssamara@cs.ucy.ac.cy
Partner 3:	***UNIVERSITY OF CYPRUS (UCY, CY)***
Contact person:	Cindy Wings
Email:	c.wings@orbisconcern.nl
Partner 4	***ORBIS MEDISCH EN ZORGCONCERN (ORBIS, NL)***
Contact person:	Carsten Stocklöw
Email:	carsten.stockloew@igd.fraunhofer.de
Partner 5	***FRAUNHOFER IGD (Fh-IGD, DE)***
Contact person:	Nico van der Aa
Email:	n.vanderaa@noldus.nl
Partner 6	***Noldus Information Technology BV (Noldus, NL)***
Contact person:	Eleni Christodoulou
Email:	cseleni@citard-serv.com
Partner 7	***CITARD SERVICES LTD (Citard, CY)***
Contact person:	Sascha Fagel
Email:	fagel@zoobe.com
Partner 8	***ZOOBE MESSAGE ENTERTAINMENT GMBH (Zoobe, DE)***
Contact person:	Donato Cereghetti
Email:	donato.cereghetti@hotmail.com
Partner 9	***MAISON DE RETRAITE DU PETIT-SACONNEX (MRPS, CH)***

Table of Contents

Table of Figures

Abbreviations

Abbrev.	*Description*
AAL	Ambient Assisted Living
Co-Net	Collaborative Care Network
ICT	Information and Communications Technology
PC	Personal Computer
Q-LES-Q-SF	Quality of Life Enjoyment and Satisfaction Questionnaire – Short Form
SUS	System Usability Scale
USR	User Success Rate
VCT	Virtual Care Team
VSP	Virtual Support Partner
WHOQOL	World Health Organization Quality of Life
ZBI	Zarit Burden Interview

Executive Summary

The main aim of the Miraculous-Life project is to design, develop and evaluate an innovative user-centric technological solution, the Virtual Support Partner (VSP), attending to the elder daily activity and safety needs, while the elder goes about his normal daily life. The VSP will provide implicit support which is based on behaviour and emotional understanding and will interact with the elder exhibiting distinctive emotions, delivered in a human like way simulating in essence the interaction with a real life partner.

Operation and validation of the Miraculous-Life system will be performed in two real environment settings, by ORBIS in the Netherlands and by MRPS in Switzerland, representing two well selected use cases, where elders can live and manage their daily life activities with the greatest possible independence. In the Netherlands, ORBIS has developed an innovative integrated Elderly Living Village concept, the Parc Hoogveld which includes a multifunctional centre as well as an assisted living complex and several modern apartment complexes where the elders live independent. The pilot will be operated in the apartment setup, where the elderly live independently and get only support as required. MRPS, which is the oldest and largest care organization in the Canton of Geneva, will carry out the second pilot in their specialized apartments where elder live independent and undertake support as needed.

This deliverable provides the design of the pilots' pre-trials and trials. More specifically, it describes how the two trial sites will be organized and how the evaluation data will be collected. Also an inventory of the available resources and a specification of what needs to be added, extended or adapted for the support of the proposed pilots is made. Furthermore, it defines the user groups that will participate in the pre-trials and the trials as well as what kind of training will be provided to them. In addition, the overall evaluation approach (i.e., the quantifiable success indicators, the evaluation methodologies and evaluation questionnaires) that will be used both for the pre-trials' and the trials' evaluation, is defined in detail.

All the users involved in the pilots' pre-trials and trials will be invited to sign an informed consent document. The selection will be based on specific inclusion criteria and will contemplate profile variations within the target audience that the project aims to reach (sex, daily habits, capabilities, preferences, technological skills, social status, and nationality).

1 About this Document

1.1 Role of the deliverable

The main role of this deliverable is to provide the initial trials setup and design and examine issues like how the trial sites will be organized, what kind of training will be needed, how the evaluation data will be collected and define the user groups that will participate in the trials. Also an inventory of the available resources and a specification of what needs to be added, extended or adapted for the support of the proposed pilots, is made. In addition, the overall evaluation approach (i.e., the quantifiable success indicators, the evaluation methodologies and evaluation questionnaires) that will be used both for the pre-trials' and the trials' evaluation, is defined in detail.

1.2 Relationship to other Miraculous-Life deliverables

The deliverable is related to the following Miraculous-Life deliverables:

Deliverable	*Relation*
D1.1	Specification of user needs analysis and design of VSP model: This document presents the end user needs analysis and functional requirements for Miraculous-Life system. D6.1 builds on results provided by D1.1.
D1.2	Specification of use case scenarios and User Interface: This document presents the use case scenarios and also an analysis of the interaction requirements needed to specify the Human-Computer interface. D6.1 builds on results provided by D1.2.
D1.3	Ethical, Privacy, Legal Considerations and Deontological practice: This document presents the ethical, deontological and legal considerations that are relevant for the Miraculous-Life project. D6.1 builds on results provided by D1.3.
D1.4	User pre-trials evaluation: This document will obtain user feedback and assess the users' acceptance based on pre-trials that will be performed on the first rapid prototypes of the Miraculous-Life system. D6.1 will be provided as input to D4.1 and will be considered during the pre-trials acceptance evaluation results.
D6.3	Pilot setup and deployments: This deliverable (which includes both a report and software) presents how the system will be setup and how the pre-trial tests will be performed. D6.1 will be provided as input to D6.3 and will be considered during the pilot setup and deployments.
D6.4	Pilot acceptance evaluation results: This document assesses the acceptance of the final Miraculous-Life system based on experiences and evaluation data gathered by the two pilots. D6.1 will be provided as input to D6.4 and will be considered during the pilot acceptance evaluation results.
D6.5	Overall system evaluation and initial deployment: This deliverable (which includes both a report and software) will produce a Miraculous-Life system initial deployment report by consolidating the findings of the pilot operation of the services. D6.1 will be provided as input to D6.5 and will be considered during the overall system evaluation and initial deployment.

1.3 Structure of this document

Following the current introductory chapter, the rest of this document is structured as follows. Chapter 2 analyses the available infrastructure, describes how the trial sites are organized and how the evaluation data will be collected. Also an inventory of the available resources and a specification of what needs to be added, extended or adapted for the support of the proposed pilots is provided. Chapter 3 defines the user groups that will participate in the pre-trials and the trials as well as the training that will be provided to them. Chapter 4 describes in detail the overall evaluation approach (i.e., the quantifiable success indicators and the evaluation methodologies) that will be used both for the pre-trials and the trials evaluation of the Miraculous-Life system. Finally, the main conclusions are provided in Chapter 5.

Appendix A and Appendix B provide the pre-trials' and trials' evaluation questionnaires, respectively. Appendix C describes the user group selection questionnaire. Appendix D provides the objectives and indicators associations with the pre-trial's and the trial's evaluation questionnaires.

2 Analysis of the available infrastructure

This chapter provides an inventory of the available resources and a specification of what needs to be added, extended or adapted for the support of the proposed pilots and also how the trial sites are organized ((1) ORBIS Hoogstaete, Sittard (NL) and (2) Maison de Retraite du Petit-Sacconex, Geneva, (CH)). Moreover a description of how the evaluation data will be collected is provided.

2.1 ORBIS Hoogstaete, Sittard, (NL)

2.1.1 Available Resources and Needs

ORBIS, specifically ORBIS Hoogstaete (trial site), is an elderly home which is situated in the town of Sittard-Geleen, the Netherlands. ORBIS Hoogstaete is an elderly home which is part of the ORBIS Medical and Healthcare group. ORBIS Hoogstaete is divided in an elderly home (106 clients), small scale living (46 clients) and 3 apartment blocks (80 clients independent living/homecare and elderly home). The elderly home and small scale living are controlled environments with 24/7 availability and presence of staff. Care in the apartment blocks is divided in homecare on demand and 24/7 care like an elderly home.

The staff generally consists of nurses, caregivers, domestic workers and members of the animation team. There is a member of the animation team which is specially trained in guiding elderly to use “technical” devices. Because of our experience in earlier projects we have special weekly group activities for elderly in using technical devices like computers, tablet PCs and smart phones. These groups are in cooperation with students from the nearby high school. This structure is also available for the training and instructing the participants of the Miraculous-Life project. Technical assistance is arranged structural during the week and on request. Furthermore, a lot of staff members and all the members of the animation team have, because of earlier experiences, a lot of knowledge in assisting elderly in using technical devices but they need to be trained and instructed for this projects and used technologies.

For medical advice, within the Miraculous-Life project, there is the physician specialist elderly care available to advice during the lifetime of the project and also during the trials.

From technical perspective ORBIS Hoogstaete is fully equipped with WiFi access in the elderly house and small scale living. Clients from the apartment blocks have sometimes their own WiFi. Therefore, for the clients in the Apartments blocks that don’t have WiFi connection we need to provide them with internet connection, during the project.

Moreover, at this early stage of the project, the following needs are identified in order to support the pilot for the trial phase. A server must be installed in ORBIS and all the necessary devices like tablets, computers, Kinect camera and possibly some external sensors needs to be acquired. All these technologies and devices need to be bought during the project.

Moreover, the following rooms within the complex will be used during the trials:

- Conference room during the pre-trials
- The homes (10) of the elderly in the elderly house
- The care apartments (10) of the elderly

If necessary, other rooms in our elderly home and care apartments will also be available. However, at this stage of the project this seems not feasible.

2.1.2 Organization of the trial site

The pre-trial will be performed in the conference room of the elderly house.

The trial will be performed in 10 apartments of elderly in the assisted living complex named ORBIS Hoogstaete and 10 care apartments in the three apartment blocks named Silverstaete, Greenpark and Springfield.

ORBIS Hoogstaete is divided in an elderly home (106 clients) and small scale living (46 clients). The elderly home and the small scale living are controlled environments with 24/7 availability and presence of staff. The apartments of the elderly home (which will be used during this project) have an average size of 24 square meter and consists of 3 rooms: a living room including a small open kitchen, a bedroom and a bathroom.

In the 3 apartment blocks (Silverstaete, Greenpark and Springfield) live 80 clients. Care in these apartment blocks is divided in homecare on demand and 24/7 care like an elderly home. The apartments in these apartment blocks have an average size of 50 square meters and consist of a living room including an open kitchen, two bedrooms, a bathroom and a balcony.

The plan of the apartments can also be found in the D6.3 Pilot setup and deployments.

ORBIS Hoogstate – Elderly Home

Greenpark, Springfield, Silverstaete – Care Apartments

Figure 1: ORBIS Pilot Trial Sites

2.2 Maison de Retraite du Petit-Sacconex, Geneva, (CH)

2.2.1 Available Resources and Needs

La Maison de Retraite du Petit-Saconnex (MRPS), is the oldest and largest elderly care institution in the Canton of Geneva. Founded in 1849, MRPS is the only institution in the Canton of Geneva offering to its residents the possibility to preserve their life style in spite their advanced age, facilitating at the same time their transition to a nursing home when their health condition requires so.

MRPS is composed of: (1) a high quality nursing home (Etablissement Médico-Social, EMS) for the elderly who require continual nursing care and have significant difficulty coping with the required activities of daily living, housing 196 residents and (2) specialized residences for the elderly supporting them to their independent and semi-independent needs, hosting 220 residents. In the residences, homecare assistance is available on demand, 7 days a week. The staffs consist primarily of nurses, nursing auxiliary and

domestic workers. Note that the target group of the Miraculous-Life project is composed of elderly living in the specialized residences – see chapter 3.

At this early stage of the project, the following person-resources are identified: (1) the nursing staff, (2) the animation team, (3) consortium partner UniGe, (4) the ICT department of MRPS, and (5) the Data Protection Officer of the Canton of Geneva.

- The nursing staff will participate to the two pre-trials (month 8 and month 16) and will use the Miraculous-Life system during the trial phase (months 26-32). Occasionally, they will be available for individual or group interview.
- The animation department will also use the Miraculous-Life system during the trial phase (months 26-32).
- UniGe and the ICT department of MRPS will set-up the Miraculous-Life system, ensuring the proper functioning.
- Finally, the Data Protection Officer of the Canton of Geneva (http://www.ge.ch/ppdt/) will certify that the data protection plan designed by the MRPS Manager (see D6.2 Privacy Protection Plan) is in full compliance with the Cantonal and with the National law.

The following infrastructures, material and equipment are available: (1) the conferences rooms *Hodler*, *Hainard*, *Hachette* and *Fazy*, (2) the catering service and (3) the MRPS server room.

- The MRPS restaurant “Le Jardin des Iles” (http://www.jardindesiles.ch/) rents four seminar and conference rooms: *Hodler*, *Hainard*, *Hachette* and *Fazy*. The pre-trials will take place in these rooms.
- The MRPS restaurant “Le Jardin des Iles” (http://www.jardindesiles.ch/) will also provide water and fruit to the participants during the pre-trials.
- The server for the trial phase could be installed in the MRPS server room; ensuring the security of the data.

Finally, at this early stage of the project, the following needs are identified:

- All the technologies should be bought; including tablets, workstations and Kinects.
- A dedicated served – physical or virtual – should be installed in MRPS for the trial phase.

Note that most residents in MRPS don’t have an internet connection. Internet connection should be ensured to all participants during the trial phase.

2.2.2 Organization of the trial site

The pre-trials will be performed in the seminar and conferences rooms belonging to the MRPS restaurant “Le Jardin des Iles” (http://www.jardindesiles.ch/): *Hodler*, *Hainard*, *Hachette* and *Fazy*.

The trial will be performed in the specialized residences. The residences are located in the Colladon Residence (Les Frênes, Les Hortensias) and in the Trembley Residence (Les Azalées, Les Erables). The Tremblay Residence consists of 100 studios and apartments. The average size of one-person studios is 28 square meters, with or without Kitchenette; while one-bedroom apartments (average size of 56 square meters) are available for couples. The Colladon Residence consists of 107 standing apartments for one person or a

couple. Apartments for single person are 47 square meters, including a kitchen open on the dining area, a large bedroom, a hall, a bathroom and a balcony. 2-room apartment (54 square meters) and 3-room apartment (77 square meters) are available for couples. The plan of the apartments can also be found in D6.3 Pilot setup and deployments.

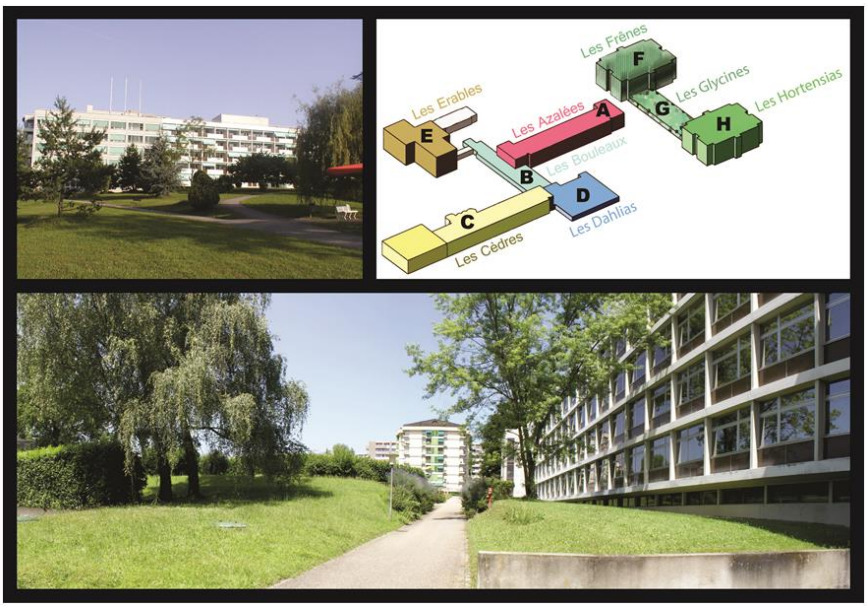

Figure 2: MRPS Pilot Trial Sites

2.3 Collection of the evaluation data

The participants of MRPS and ORBIS will be provided with an informative brochure explaining the aims of the Miraculous-Life project in their native language. Furthermore, the informed consent is mandatory prior to any data collection, storing, processing, and transferring. These documents can be consulted on the D6.2 Privacy Protection Plan. Data will be collected via different sources including questionnaires, individual or group interview, observations by investigators and by care professionals, event logs records and sensors. Note that all the data collected will be anonymized and securely stored locally. Only authorized personnel can have access to the data. More information concerning the protection of the data could be found in D6.2 Privacy Protection Plan.

3 Definition of User Groups

This chapter defines the user groups that will participate in the pilot trials and what kind of training will be provided to them.

3.1 User Group Definition

The target group of Miraculous-Life (defined to be 65+ years old), is the big group of healthy elderly or with light related physical or cognitive ageing related degradations who live alone at home and can find pleasure and relief in getting help or stimulation to carry out their daily activities. All the elderly participating in the study will be recruited voluntarily based on the following inclusion criteria:

- Expression of interest in the project.
- Belonging to the “young old” (over 65 years old) or “older old” age groups (over 80 years old).
- Living alone in independent homes (i.e., the apartment blocks Silverstaete, Springfield and Greenpark) or in the assisted living facilities (ORBIS Hoogstaete).
- Being healthy and active (physically, mentally and socially) at the time of the study.
- Not using a wheelchair inside the home (as this would interfere with the setup of the devices).
- Signed a consent form after being informed.

The elderly participating in the study will be categorized according to their ICT skills, age, gender, profession and nationality.

Furthermore, formal and informal caregivers will participate in the project. Informal caregivers will be family members or friends of the elderly participating in the study. Formal caregivers are members of the animation team, care coordinators, nurses and the physician specialist elderly care.

The first and the second pre-trial will be carried in a supervised environment setting with a small number of selected users. At least 7 participants will be recruited for each pre-trial, including elderly (primary end-users) living in the assisted living complex and in the care apartments and formal caregivers (secondary end-users) working in the assisted living complex and in the care apartments. Note that the elderly participating in the first pre-trial (month 8) will be encouraged to participate in the second pre-trial (month 16) as well as in the trial (months 26-32) with the aim of (1) collecting longitudinal data and (2) training the group of end-users.

During the trial phase, elderly (primary end-user), formal and informal caregivers (secondary end-users) will be involved. For the ORBIS pilot, ten (10) elderly living in the assisted living complex and ten (10) elderly living in the care apartments will be recruited. For each one of the primary end-users, a care community network will be build consisting of at least two people representing for example the categories: family, neighbour, friend and formal caregivers. On the other hand, for the MRPS pilot, twenty (20) elderly living in the specialized residences will be recruited. For each one of the primary end-user a care community network will also be build consisting of at least two people representing for example the categories: family, neighbour, friend and formal and informal caregivers. Selected members of the elderly care community network will be also categorized according to their ICT skills, age, sex, profession, nationality.

3.2 User Group Training

3.2.1 Pre-trial training

At ORBIS, the elderly, the majority of the staff members and all the members of the animation team have already a lot of knowledge and experience in participating in AAL projects. They will use this knowledge and experience in the pre-trials. Furthermore, at ORBIS, the elderly already started learning how to use the required technology as they participate in special weekly group activities in using technical devices like computers, tablet PCs and smart phones.

Prior to the two pre-trials, informative presentations/explanations will take place in MRPS and ORBIS in order to explain the aims of the Miraculous-Life project and the data collection process to both formal caregivers and elderly. During these presentations, the project professionals will:

1) Identify the needs and the requirements of the end-users and test the Miraculous-Life solution,
2) Introduce the functionalities and the services proposed by the Miraculous-Life solution (agenda, reminders, safety services, object localisation, shopping assistance, etc.),
3) Clarify the nature of the participants' involvement and responsibility in the pre-trials,
4) Motivate the elderly to participate in the project longitudinally.

Moreover, during these presentations, the project professionals will empathize and make clear to the participants that the aim of the pre-trials is to evaluate the Miraculous-Life prototype rather than to test the elderly skills or knowledge.

In addition, as the elderly and the formal caregivers of MRPS do not have any previous experience with AAL projects, the main objectives and the scope of the AAL projects will be explained to them during these informative presentations.

At the beginning of the pre-trial, both elderly and caregivers of ORBIS and MRPS will be informed about the Miraculous-Life project and they will be guided on how to use the system. This will be done with the help of the project professionals and the informative brochure that will be provided to them.

3.2.2 Trial training

All the participants (primary and secondary end-users) will be trained to use the Miraculous-Life system before the beginning of the trial.

At ORBIS, because of their experience acquired in earlier projects, they have created special weekly group activities for the elderly in using technical devices like computers, tablet PC's and smart phones. These groups involve students from the nearby high school that helps the elderly to learn how to use these technologies. This approach (students teach elderly) is also available for the training and instructing the participants of the ORBIS trial. Also, technical assistance is arranged continuously during the week and on request.

Firstly, prior to the trial, a series of presentations will be performed both in ORBIS and MRPS in order to introduce the Miraculous-Life solution and explain how the trial will unfold; ensuring that all the participants (primary and secondary end-users) will be able to

attend to at least one of them. Similarly to the pre-trial training, during these presentations, researchers will again:

1) Explain the main aims of the AAL projects,
2) Identify the needs and the requirements of the end-users and test the Miraculous-Life solution,
3) Introduce the functionalities and the services proposed by the Miraculous-Life solution (agenda, reminders, safety services, object localisation, shopping assistance, etc.),
4) Clarify the nature of the participants' involvement and responsibility in the trial,

However, for the trial, they will additionally:

5) Explain how to report personal experience while using the Miraculous-Life solution on a daily basis. Participants will be also encouraged to share not only successes and positive experiences; but also failures, problems and negative experiences,
6) Illustrate potential benefits, risks and discomforts,
7) Clarify the exit strategy concerning the equipment and data (the exit strategy is defined in D6.2 Privacy Protection Plan).

These presentations will be also followed by individual and group training:

- Primary end-users (elderly) will be trained in small groups before the beginning of the trial; with the aim of instructing how to interact with the VSP and the Miraculous-Life system. Individual training at home will be ensured at any time during the trial upon request.
- Secondary end-users (formal caregivers, informal caregivers) will be also trained in small groups before the beginning of the trial. The training of secondary end-users will focus on both the front-end application (elderly interface) and the back-end application (caregiver interface). Individual training will be ensured at any time upon request.

In addition, an easy instruction manual will be provided to all participants. Importantly, ORBIS and MRPS will identify a common strategy to train the participants for the trials.

Finally, Noldus for ORBIS and UniGe for MRPS will participate in the training process for answering any technical questions which may arise during the training. Noldus and UniGe will guide the project professionals of ORBIS and MRPS in this training process. The project professionals will then guide the elderly and caregivers.

4 Miraculous-Life Evaluation Methodology

This chapter defines the overall evaluation approach that will be used both for pre-trials and the trials evaluation. More specifically, the six main project objectives which will be achieved during the lifetime of the project as well as the quantifiable success indicators and the evaluation approach that will be used for defining and measuring the progress towards the success of these objectives, are defined.

The main project objectives are described in section 4.1. All those objectives relates to the indicators defined in section 4.2. The evaluation methodology that will be used to define and measure the progress towards the success of these objectives is described in section 4.3.

Furthermore, section 4.4 provides a detail description of the pre-trials and trial evaluation.

4.1 Miraculous-Life Objectives

The overall aim of the Miraculous-Life project is to design, develop and evaluate a Virtual Support Partner (VSP) that by analogy to a real life human partner, considering emotional understanding and responding, will attend to the needs of the elderly while he/she goes about his/her normal daily life activities in the totality of his/her home and provide implicit support and also safety.

Below the six main objectives of the Miraculous-Life, which will be achieved during the lifetime of the project, are stated:

- **Objective 1: Stimulate and motivate the elderly to remain longer active at home through a virtual partner support.**

  It has been identified that elderly people living alone at home are often suffering from loss of motivation, associated with the feeling of being helpless to carry out their daily routine especially after the loss of their partner. The main aim of this objective is to motivate the elder to remain longer active at home by providing human-like support.

  Motivation will be provided through a VSP that will attend the elderly daily activity and safety needs, while he/she goes about his/her normal daily life. Daily collaboration and interaction with the VSP will be characterized, like by a real partner, by behaviour and emotional understanding, sharing and guidance of executing daily activities, which are considered as main factors of motivating elder people to exert more effort in executing daily tasks, avoiding thus inactivity and loss of motivation.

- **Objective 2: Enhance the engagement of the elderly in carrying out daily activities at home through emotional understanding.**

  One of the main aims of this objective is to improve the engagement of the elderly in carrying out daily activities by understanding the elderly's emotional status (e.g., if the elderly is happy, sad, angry, joyful, fearful, scared, neutral, etc.).

  Focus will be given on analysing how the elderly use emotions in real human communication while carrying out of their daily activities. The emotional state of the elderly provides important information on their needs and allows on one side the provision of appropriate adapted support and on the other side comforts them as they feel better understood and thus empowering them to continue carrying out their daily activities.

- **Objective 3: Increase the elderly's satisfaction in using the system via a natural and intuitive way to interact with the system**

Elderly's satisfaction in using the system will be increased by the provision of an Avatar based interface capable of interacting with the user through both language (emotional speech) and non-verbal behaviours (emotional facial expression). In order to engage the elder in a relevant, human-like conversation the Avatar interface will be also able to express emotions, (i.e., happy, concerned, neutral state) through face expressions with lifelike motion and voice intonations, matching the conversation context and synchronized with the synthesized speech.

The satisfaction of the elder in using the system will be also increased through the provision of a dialogue management that will make the system more engaging to the elders to interact with. The system will be able to hold multiple interactions and build emotional attachments with the elder in the same way humans do.

- **Objective 4: Improve quality of life and prolong autonomy of the elderly.**

  The main aim of this objective is to impact highly the quality of life and prolonging autonomy of the elder over the ageing process, taking into consideration the users' affective state, behaviour and environment context, and past interactions, by designing and developing a set of interoperable software services.

  These services will aid in the execution of daily life activities of the elder and cover the needs of the elder in the categories of Care & Wellness, Guidance, Education/Leisure and also safety. Moreover, by enabling personal choices and adaptation of the system to the elders' personalized needs and capabilities, over the ageing process, it is expected that the system will substantially prolong personal autonomy of the elder.

  The introduction of the system early enough in the life of the elder (65+) will also allow for early increase of motivation and positive interest of the elders to have the system in their life over the ageing, preventing thus early degradation of skills and capabilities, and as a consequence prolong their autonomy in carrying out daily activities at home.

- **Objective 5: Provide benefits on the social level of the elder and also improve the integrated care processes for elderly care at home.**

  Through the provision of a Collaborative Care Network (Co-Net), it is expected that the elderly people will be stimulated to keep or even increase their social interactions contributing thus positively to their overall wellbeing. Co-Net will also reinforce collaboration between both the elder and formal and informal carers in the sense of instant communication and personalized daily activities support, improving thus elder social interactions with their informal and formal carers

  This objective aims also to provide improvement in the integrated care processes for elderly care at home. Nowadays, the predominant model of support for elders living alone at home is provided mainly by informal carers and includes mainly (non-continuous) assistance in enabling and sustaining management of activities of daily life combined with emotional understanding and support.

  Through the use of Co-Net continuous collaboration and communication between the elder and formal/informal carers will be enabled. Also an intelligent sharing system of intelligent alerts and information, to both the elderly and formal and informal carers, will be provided. Based on these, it is expected that Miraculous-Life will improve highly the efficiency and continuity of integrate care provision to the elderly, resulting thus in reduction of the demand of care resources and of the burden of care by the informal caregivers.

- **Objective 6: Achieve high usefulness of the system for the user through pilots and related evaluation and assessment.**

  The main aim of this objective is to prove high usefulness of the system for the user through the carrying of two pilots and related evaluation and assessment. Two realistic environmental settings will be considered through the operation and evaluation of two pilots in the Netherlands (ORBIS) and Switzerland (MRPS).

  Both pilots will involve elderly people who fulfil the Miraculous-Life target group requirements. A minimum of 120 users (elderly people and their caregivers) will use Miraculous-Life over long periods of time (up to six months).

4.2 Quantifiable Success Indicators

In this section, for each project objective indicator we define a set of quantifiable measures that will be used for defining and measuring the progress towards the success of these objectives. Also the expected impact of each objective is defined.

Objective 1: Stimulate and motivate the elder to remain longer active at home through a virtual partner support.

- **Expected Impact:** Motivating elder people to exert more effort in executing daily tasks, avoiding thus inactivity and loss of motivation.
- **Quantifiable Success Indicators:** For this objective two indicators have been set:
  1) Average time spent by the elder to make use of different services to be significantly decreased (targeting 60%) from the beginning till the end of the project
  2) Motivation of the elder in using the system to be substantially increased (targeting 80%) from the beginning till the end of the project.

Objective 2: Enhance the engagement of the elder in carrying out daily activities at home through emotional understanding.

- **Expected Impact:** The elders feel overall better understood and empowered to continue an active life at home.
- **Quantifiable Success Indicators:** For this objective two indicators have been set.
  1) The preciseness of elder's emotional understanding to be significantly improved (targeting 60%) from the beginning till the end of the project.
  2) A good improvement (targeting 40% increase) in the number of daily activities carried out by the elder at home, from the beginning till the end of the project.

Objective 3: Increase the elder's satisfaction in using the system via a natural and intuitive way to interact with the system.

- **Expected Impact:** The elders accepts and embrace the system and feel overall better motivated to use the system.
- **Quantifiable Success Indicators:** For this objective one indicator have been set:

1) The satisfaction feeling of the elder in interacting with the system to be increased from good (initial target 45%) at month 24, to very good (final target 75%) at the end of the project.

Objective 4: Improve quality of life and prolong autonomy of the elder.

- **Expected Impact:** The elder remains longer active preventing thus early degradation of skills and capabilities.
- **Quantifiable Success Indicators:** For this objective three indicators have been set:
  1) Good improvement (targeting 40%) in the way the elder is carrying out daily activities at home, from the beginning till the end of the project.
  2) Number of support alerts needed by the elder in carrying out their daily activities to be significantly reduced (targeting 60%), from the beginning till the end of the project.
  3) Good improvement (targeting 40% increase) in the quality of life of the elder, from the beginning till the end of the project.

Objective 5: Provide benefits on the social level of the elder and also improve the integrated care processes for elderly care at home.

- **Expected Impact:** The elders become more social improving thus their overall wellbeing. Improve the efficiency and continuity of integrated care provision to the elder.
- **Quantifiable Success Indicators:** For this objective three indicators have been set:
  1) Significantly increase (targeting 65%) the elder social interactions with their informal and formal carers from the beginning till the end of the project.
  2) Good improvement (targeting 45% reduction) on the care consumption (including actual elder's support visits of informal and informal carers at home), from the beginning till the end of the project.
  3) Significantly reduce (targeting 60%) the care stress of the carers from the beginning till the end of the project.

Objective 6: Achieve high usefulness of the system for the user through pilots and related evaluation and assessment.

- **Expected Impact:** The elder recognizes technological solutions to be of high usefulness in carrying out their daily activities at home.
- **Quantifiable Success Indicators:** For this objective one indicator have been set.
  1) The elder's rating of usefulness of the system to be substantially increased (targeting 75%) from the beginning till the end of the project.

For all the indicators specified above, slight deviations from the targeted values are expected, due to the dynamic classification of the participants (i.e., different gender, health status, knowledge and experience with computing, attitude towards technology, etc.) that will evaluate the system. Thus, we are using three levels to classify the improvements. More specifically, we consider good improvements to be in the range of

30% to 45%, significant improvements in the range of 46% to 65% and substantial improvements in the range above 66%.

4.3 Evaluation Methodology

The evaluation methodology to be used in the project will consist of an expert-based evaluation, a user-based evaluation in a controlled environment, and a user-based evaluation at the elderly home. The methodology will further provide a combination of recognized qualitative and quantitative usability analysis methods to report the findings, covering the project's pre-trials as well as the project's final trial.

Qualitative analysis components such as user personal comments and expert observations will be used. For the quantitative analysis of the system, questionnaires which will be filled in by the end users as well as their caregivers were constructed (see Appendix A and Appendix B). The pre-trials questionnaires are simpler, as certain features of the complete system will not be possible to asses due to their prototype nature. However, the trial questionnaires, along with automatically gathered measurements will provide a full picture for every indicator mentioned in section 4.2.

Furthermore, a selection questionnaire (see Appendix C) will be used to ensure that the end users sample participating in the trials will be representative of the general target audience of the system. The constructed questionnaires incorporate elements of standardized and validated questionnaires adapted to our system. In detail, the trials and pre-trial questionnaires comprise of questions adapted from the System Usability Scale (SUS) and User Success Rate (USR) [1] [2], which are widely used to assess the usability of a system. Parts of Social Presence questionnaires were used in order to measure the realism and the engagement involving the avatar system [3] [4] as well as the Perception of the Personality of the avatar by the user [5]. Furthermore, questions aiming to gauge the Quality of Life of the end user were adapted and included from the Q-LES-Q-SF (Quality of Life Enjoyment and Satisfaction Questionnaire – Short Form) questionnaire. In order to access the indicators of objective 5, the Zarit Burden Interview (ZBI) questionnaire, which aims in assessing the reduction of the burden of care of the caregivers, was adopted (mainly for the trial questionnaire).

For most of the questions/statements (Parts A through E), addressed in the questionnaires, a Likert-type scale from -3 to 3 is used. For example for the statement *"I find pleasure in carrying out my daily activities by using the system"* the selections: *(-3) Strongly disagree, (-2) Tend to disagree, (-1) Slightly disagree, (0) Indifferent, (+1) Slightly agree, (+2) Tend to agree and (+3) Strongly agree,* are used. Part F of the Trials' questionnaire uses a Likert-type scale from -2 to 2 *((-2) Very Poor, (-1) Poor, (0) Fair, (+1) Good, (+2) Very Good*) while for Part G a Likert-type scale in the range of 0 to 4 is used *((0) Never, (1) Rarely, (2) Sometimes, (3) Quite Frequently, (4) Nearly Always).* Finally, Part F of the Pre-Trials' and Part H of the Trials' questionnaire gauges the moral aspects of the system.

In order to evaluate the filled in questionnaires, each question is associated with specific objectives and indicators, allowing the extraction of a numeric score for each one of them (see Appendix D). The numeric score for each indicator will be provided by summing up the score of the associated questions and then normalizing these sums as a percentage. For indicators where there are automatic measurements, the normalized scores will be factored in along with the (also normalized) measurements in order to produce an overall score. The pre-trial scores will serve as a pointer to which aspects of the system need to be refined and reworked while the trial scores will be used to evaluate the whole system.

Specifically the trial questionnaires will be filled in by the end users at the early stages of the trials and once more at the end of the trials allowing the comparison and gauging of the improvement on the system's objectives.

The overall evaluation approach of Miraculous-Life includes:

- Project's pre-trials (month 8 and month 16):
  1) Expert-based evaluation phase (see section 4.3.1)
  2) User-based evaluation phase in a controlled environment (see section 4.3.2)
- Project's trial (month 26 – month 32):
  1) User-based evaluation phase at home (see section 4.3.3) which is associated to the final system evaluation.

4.3.1 Expert based evaluation

The main purpose of the first phase of the Miraculous-Life evaluation plan is to identify and correct any major design flaws and problems before they reached production and real user testing. Expert-based evaluation is generally used to identify usability problems based on established human factors principles [7]. The experts conducting this type of evaluation can be human-computer interaction specialists, usability, and accessibility specialists, or even interface designers with experience in user-centric design principles.

Two inspection techniques will be used in the evaluation of the Miraculous-Life services, the cognitive walkthroughs and heuristics analysis [7] [8]. During the expert walkthroughs, two to four evaluators will perform a series of application specific user tasks on working or non-working prototypes, just like a real user would, and will identify the areas that could potentially cause confusion or errors to the real users. At the same time, the experts will be also asked to rate the application against the Jacob Nielsen's Heuristics list of usability principles and guidelines [7].

Cognitive walkthroughs:

The cognitive walkthrough is a method for finding usability problems in a user interface design, focusing on evaluating a design for ease of learning, particularly by exploration [7]. Cognitive walkthroughs evaluate, in sequence, each of the user actions (or steps) to perform a task, aiming to find design issues that would interfere with learning by exploration. For each action, the evaluators should produce credible success and failure stories concerning the interaction between the end-user and the system: "they ask what the user would be trying to do at this point and what actions the interface makes available. If the interface design is a good one, the user's intentions should cause that person to select the appropriate action" [7]. According to Wharton in [7] this method also allows identifying (1) discrepancies between users' and designers' representation of a task, (2) poor choices of wording for menu titles and button labels, (3) inadequate feedback on users' action.

Stage 1: Preparatory phase

All the evaluators will be aware of the input necessary to perform the cognitive walkthrough inspection, namely: the user population, the tasks, the action sequence for each task, and the interface.

1) User population: Who will be the users of the system? The target group of Miraculous-Life (defined to be 65 +), is the big group of healthy elderly or with light related physical or cognitive ageing related degradations who live alone at home and can find pleasure and relief in getting help or stimulation to carry out their daily activities. The users don't necessarily have background knowledge or particular skills on technology.
2) The tasks: What tasks will be analysed?
3) Action sequence for each task: what is the correct action sequence for each task and how is it described?
4) The interface: the cognitive walkthrough will be performed on the first and second Miraculous-Life prototype provided by UniGe (for MRPS) and by Noldus (for ORBIS) on month 8 and on month 16.

Stage 2: Evaluation phase

During the evaluation phase, four evaluators will perform some specific user tasks on the prototype, just like a real user would, and will identify the areas that could potentially cause confusion or errors to the real users. The evaluators will examine each action of each task in the workflow path and attempt to tell a credible story as to why the expected users would choose that action (how a user chooses the correct action at each step?). Note that credible stories are based on assumptions about users' background and goals, and on an understanding of the problem-solving process that enables a user to guess the correct action. In order to produce credible stories (including success and failure stories), the evaluators ask the following questions:

- Will the user try to achieve the right effect (form the right goal)? Given their domain goal, will they identify the correct device goal? The users have an end goal in mind, but needs to accomplish various actions to complete it. Will they even know to perform the specific steps along the way? Users may know what effect to achieve: (1) because it is part of their original task, or (2) because they have experience using a system, or (3) because the system tells them to do it.
- Will the user notice that the correct action is available? Will the user be able to discover the action to perform easily? Is the option visible and on the screen, or at least in a place the user will likely look? Users may know an action is available: (1) by experience, or (2) by seeing some device (like a button), or (3) by seeing a representation of an action (like a menu entry).
- Will the user associate the correct action, with the effect trying to be achieved? Will it be obvious that the action addresses the goal? If an icon is used, is it an accurate representation of the action? Is the label worded in a way that the user expects? Users may know an action is appropriate for the effect they are trying to achieve: (1) by experience, or (2) because the interface provides a prompt or label that connects the action to what they are trying to do, or (3) because all other actions look wrong.
- If the correct action is performed, will the user see that progress is being made toward solution of the task? Will the feedback be helpful? Is there any feedback showing that the user selected the right option? Are the terms or graphics used during the feedback effective? Is the next logical action presented successfully? Users may know things are going OK after an action: (1) by experience, (2) by

recognizing a connection between a system response and what they were trying to do.

Note that success stories require success under all four of the criteria, while failure stories typically fail under a single criterion.

Heuristic Evaluation:

According to Nielsen in [11], heuristic evaluation is a usability inspection method used to identify usability issues in interactive systems. This method also involves having a small set of evaluators interact with the interface and judge its compliance with recognized usability principles (i.e., the heuristics). These heuristics are general rules that are likely to describe common proprieties of usable interface. The revised set of usability heuristics proposed by Nielsen will be used as a starting point for this audit:

1) Visibility of system status: the system should always keep users informed about what is going on, through appropriate feedback within reasonable time.
2) Match between system and the real world: the system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order
3) User control and freedom: users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.
4) Consistency and standards: users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.
5) Error prevention: even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.
6) Recognition rather than recall: minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.
7) Flexibility and efficiency of use: accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.
8) Aesthetic and minimalist design: dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.
9) Help users recognize, diagnose, and recover from errors: error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.
10) Help and documentation: even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

After the expert walkthroughs and the heuristic evaluation are concluded, each evaluator will produce a report on the observations he/she made during the inspection. These reports will then be aggregated in a single report that will include the results from all the inspections and will be given to the development and design team of the project. Upon completion of the expert evaluation, the developers will incorporate the most important comments into the system and release the working version of the software in order to proceed for testing with real users.

4.3.2 Controlled User based evaluation

Once the improved working versions of the applications are released from the developers, the actual user-based evaluation will begin. During this phase, a selected group of elderly will be invited to participate in the evaluations and test different scenarios. The scenarios (defined in deliverable D1.2a) will be clear, precise, and relatively short to accomplish. The elderly will be requested to openly express his/her thoughts, observations, feelings, and comments to the evaluator during the testing. This is known as the Think Aloud method [9], which enables the evaluator to capture the thinking process of the user. The evaluators will be instructed to provide assistance only when absolutely needed and keep notes on what was happening and what was being said during each task.

Along with the application of the Think Aloud method, after the elderly's interaction with the system they will be asked to fill in a questionnaire (pre-trial questionnaire; see Appendix A).

4.3.3 Home-based Evaluation

The main goal of the home-based evaluation, which will be performed during the trial of the complete system, is to verify the adherence of system to the objectives described in section 4.1 through the utilization of the indicators presented in section 4.2. To do so, during the evaluation selected (through a selection questionnaire; see Appendix C) elderly will be given the system to use at home. Participants will be instructed to fill out at the beginning and the end of the evaluation period the trial questionnaire (appendix B). As presented in section 4.3, the questionnaire merges elements from standardized questionnaires (focusing on User Satisfaction, User acceptance and Quality of Life, etc.), as well as, elements addressed to the informal caregivers, as part of the care team of the elderly. Thus, the formal and informal caregivers of the elderly will be instructed to fill out those specific parts of the trial questionnaire.

Along with the filled in questionnaires, the analysis of the automatic measurements taken by the system will be correlated with the analysis of the filled in questionnaires. For example the system will log each activity performed by the elderly recording which activity was performed, when it started and ended, as well as, keep track of the number and type of messages exchanged between the VCT members and the alerts towards the elderly.

The activity logs will directly provide the number of the elderly's daily activities at different moments during the trial thus, allowing quantifying indicator 2 of objective 2 (see sections 4.1 and 4.2). Indirectly, these logs can quantify the motivation to use the system (objective 1, indicator 2), as an increase of the activities performed with the help of the system shows that the elderly is motivated to use it. Further analysis of the activity logs will provide the average time spent by the elderly to make use of the provided by the system services (objective 1, indicator 1).

On the other hand, keeping track of the number of messages exchanged between the VCT members will quantify indicator 1 of objective 5 while knowing the number of alerts and support messages directly links with indicator 2 of objective 4, as well as indirectly links with indicators 2 and 3 of objective 5.

Finally, for evaluating indicator 1 of objective 2, the replies to the related questionnaire elements will be correlated with analysis of video captured during the training of the elderly for the trial. The emotions of the elder will be recognized automatically through the system. For more precise emotion recognition the elder will be trained to stand in front of the Avatar in well-defined positions. These training sessions will be captured on video which will then be correlated with the system's appreciation of the user's emotional state. It is expected that by having better emotion recognition through his/her positioning the elder will exert effort to improve his/her position over time resulting thus in more precise recognition.

4.4 Pre-Trials and Trial evaluations

The pre-trials will be performed in a general room at the care organisation (ORBIS Hoogstaete) and in a conference room in MRPS, not the homes of the elderly. The elderly and the caregivers will be asked to come individually to test the system. The participants will be requested to openly express his or her thoughts, observations, feelings, and comments to the evaluator during the testing. This is known as the Think Aloud method [12] which enables the evaluator to capture the thinking process of the user. The evaluators will be instructed to provide assistance only when absolutely needed and keep notes on what was happening and what was being said during each task. Different evaluation methods will be used during the controlled user based evaluation.

Devices/equipment which will be used during pre-trials:

- Internet connection (by WiFi of cable)
- Computer/laptop
- 1 tablets, lying free in the room for the elderly to take in his/her hand

Pre-trials schedule:

- During the first week of each pre-trial an experts' based evaluation (see section 4.3.1) will be performed. During the first 2-3 days of the week the experts will perform their evaluation and then produce a short report to the developers. Two evaluators from each participating end user partner (ORBIS and MRPS) will separately perform this evaluation (four evaluations in total)
- The following week, the developers will utilize the reports provided by the experts in order to correct design flaws and make desirable improvements.
- The week after the developers provide the updated system prototypes a controlled user based evaluation (see section 4.3.2) will be conducted. In this evaluation, at least 7 users (including elderly and caregivers) of ORBIS Hoogstaete and at least 7 users (including elderly and caregivers) from the MRPS residences will participate.

The trial evaluation will involve elderly people who fulfil the Miraculous-Life target group requirements (the constructed selection questionnaire will ensure that – presented in

Appendix C). A minimum of 120 users (elderly people and their caregivers) will use Miraculous-Life over long periods of time (up to six months). The system will be installed in the user's home and the trial questionnaire will be provided to them with instructions to be filled at the beginning and at the end of the trial period. After the end of the trial period, the filled in questionnaires will be collected and analysed to quantify the indicators defined to evaluate each objective of the project along with the system's automatic measurements. Section 4.3.3 describes this process and Appendix D provides the association of each question of the questionnaires (both for the pre-trials and trial) with specific indicators and objectives (the objectives are described in sections 4.1, indicators in 4.2 and in section 4.3 more details are provided on the analysis of the questionnaires).

5 Conclusion

Operation and validation of the Miraculous-Life system will be performed in two real environment settings, by ORBIS in the Netherlands and by MRPS in Switzerland, representing two well selected use cases, where elders can live and manage their daily life activities with the greatest possible independence. In the Netherlands, ORBIS has developed an innovative integrated Elderly Living Village concept, the Parc Hoogveld which includes a multifunctional centre as well as an assisted living complex and several modern apartment complexes where the elders live independent. The pilot will be operated in the apartment's setup, where the elderly live independently and get only support as required. MRPS, which is the oldest and largest care organization in the canton of Geneva, will carry out the second pilot in their specialized apartments where elder live independent and undertake support as needed.

The first and the second pre-trials will be carried in a supervised environment setting with a small number of selected users. At least 7 participants will be recruited for each pre-trial, including elderly (primary end-users) living in the assisted living complex and in the care apartments and formal caregivers (secondary end-users) working in the assisted living complex and in the care apartments. Note that the elderly participating in the first pre-trial (month 8) will be encouraged to participate in the second pre-trial (month 16) as well as in the trial (months 26-32) with the aim of (1) collecting longitudinal data and (2) training the group of end-users.

Both pilots will involve elderly people who fulfil the Miraculous-Life target group requirements. A minimum of 120 users (elderly people and their caregivers) will use Miraculous-Life over long periods of time (up to six months). The selection of these users will be based on specific inclusion criteria and will contemplate profile variations within the target audience that the project aims to reach (sex, daily habits, capabilities, preferences, technological skills, social status, and nationality).

The participants involved in the pre-trials and trials evaluations, will be provided with an informative brochure explaining the aims of the Miraculous-Life project. Also, prior to the pre-trials and the trials, appropriate training will be provided to them on how to use the different functionalities of the system. All the users involved in the pre-trials and trials will be invited to sign an informed consent document.

The evaluation and assessment of Miraculous-Life system will be carried out considering its social, economic and psychological dimensions. This will be done by analysing and reporting on the experiences and evaluation results of the two pilots and by producing a Miraculous-Life system initial deployment report by consolidating the findings of the pilot operation of the services.

Publication of the evaluation results collected from the Miraculous-Life system pre-trials and trials evaluation will be included in deliverables D1.4 and D6.4. Results associated with the final system evaluation will be included in deliverable D6.5.

References

[1] J. Brooke, “SUS-A quick and dirty usability scale”, Usability evaluation in industry 189: p. 194 (1996).

[2] J. Nielsen, “Success rate: the simplest usability metric”, Jakob Nielsen’s Alertbox, (2001).

[3] M. Lombard, T. B. Ditton, D. Crane, B. Davis, G. Gil-Egui, K. Horvath, J. Rossman, (2000), “ Measuring presence: A literature-based approach to the development of a standardized paper-and-pencil instrument”, Third International Workshop on Presence, Delft, The Netherlands.

[4] F. Biocca, C. Harms, J. K. Burgoon (2003), “Toward a More Robust Theory and Measure of Social Presence: Review and Suggested Criteria”, Presence: Teleoperators and Virtual Environments, 12(5), 456–480.

[5] Z. Kasap, N. Magnenat-Thalmann, (2007), “Intelligent virtual humans with autonomy and personality: State-of-the-art”, Intelligent Decision Technologies,1(1), 3-15.

[6] F. D. Davis, (1989), “Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology”, MIS Quarterly, 13:3, 319-340.

[7] C. Wharton, J. Rieman, C Lewis, P. Polson, “The cognitive walkthrough method: A practitioner’s guide”. Usability inspection methods, p. 105-140 (1994).

[8] J. Nielsen, R. Molich, “Heuristic evaluation of user interfaces”, in Proceedings of the SIGCHI conference on Human factors in computing systems: Empowering people. 1990. ACM.

[9] C. Lewis, J. Rieman, “Task-Centered user interface design. A Practical Introduction”, 1993.

[10] J. Nielsen, “Success Rate: The simplest usability metric”, Jakob Nielsen’s Alertbox, (2001).

[11] Nielsen, J., and Mack, R. L. (Eds.) (1994). “Usability Inspection Methods”. John Wiley & Sons, New York, NY, ISBN 0-471-01877-5, p. 25 – 62.

[12] Lewis, C. and J. Rieman, “Task-centered user interface design: A Practical Introduction”, 1993.

Appendix A Pre-Trials' Evaluation Questionnaire

PRE-TRIAL EVALUATION QUESTIONNAIRE

THIS QUESTIONNAIRE IS COMPRISED OF FOUR PARTS RELATED TO THE EVALUATION OF THE MIRACULOUS LIFE SYSTEM:

PART A – SYSTEM USABILITY

PART B – EASE OF LEARNING

PART C – SYSTEM USEFULNESS

PART D – AVATAR AND INTERFACE

PART E – USER SATISFACTION

PART F – MORAL ASPECTS

PLEASE ANSWER TO ALL THE PARTS OF THIS QUESTIONNAIRE. THE PURPOSE IS TO ASSESS THE EXTENT TO WHICH YOU ARE SATISFIED WITH THE MIRACULOUS-LIFE SYSTEM.

IN PARTS A TO E, PLEASE NOTE THE EXTENT TO WHICH YOU AGREE WITH EACH OF THE STATEMENT PROVIDED. NUMBER **-3** REPRESENTS THE STATEMENT "STRONGLY DISAGREE" AND **+3** "STRONGLY AGREE". MORE SPECIFICALLY:

-3 - STRONGLY DISAGREE

-2 - TEND TO DISAGREE

-1 - SLIGHTLY DISAGREE

0 - INDIFFERENT

+1 - SLIGHTLY AGREE

+2 - TEND TO AGREE

+3 - STRONGLY AGREE

IN PART F, PLEASE PROVIDE YOUR OPINION ON THE STATEMENTS REGARDING THE MORAL ASPECTS OF THE SYSTEM.

THIS QUESTIONNAIRE IS ANONYMOUS AND ALL QUESTIONNAIRES WILL BE HELD SECURELY AND CONFIDENTIALLY.

THANK YOU VERY MUCH FOR YOUR PARTICIPATION.

Participant's code: _____

Coder's name: _____

PART A – SYSTEM USABILITY

A 1)	I think that I would like to use this system frequently.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
A 2)	I found the system unnecessarily complex.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
A 3)	I thought the system was easy to use.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
A 4)	I think that I would need the support of a technical person to be able to use this system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
A 5)	I found the various functions in this system were well integrated.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
A 6)	I thought there was too much inconsistency in this system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
A 7)	I would imagine that most people would learn to use this system very quickly.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
A 8)	I found the system very cumbersome to use.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
A 9)	I felt very confident using the system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
A 10)	I needed to learn a lot of things before I could get going with this system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**

PART B – EASE OF LEARNING

B 1)	It is easy to learn to use the system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
B 2)	I learned to use the system quickly.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
B 3)	I easily remember how to use the system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
B 4)	Performing tasks is always straightforward.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
B 5)	I quickly became skilful with the system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**

PART C – SYSTEM USEFULNESS

C 1)	I think that the system could help me to be more effective in carrying out my daily activities.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 2)	I think that the system could give me more control over the activities/tasks in my daily life.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 3)	I think that the system could make me feel less stress by making use of the system for managing my daily activities/tasks.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 4)	I think that the system could help me to complete my daily activities/tasks quickly.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 5)	I think that the system could help me to complete my daily activities/tasks more easily.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 6)	I think that the system could make me feel more motivated to carry out my daily activities/tasks.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 7)	I think that the system could make me feel safer in carrying out my daily activities/tasks.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 8)	I think that the system could help me be more active (i.e., participate in more activities).	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 9)	I think that the system could improve my ability to perform my daily activities/tasks.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 10)	I think that the system could help me be more independent/autonomous.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 11)	I think that the system could help to reduce my demand for care from my carers.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 12)	I think that the system could save me time when I use it.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**

PART D – AVATAR AND INTERFACE

D 1)	The overall interface is good.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 2)	The appearance of the avatar is good.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 3)	The (style of) movements of the avatar are good.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 4)	The facial expression of the avatar is good.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 5)	The behaviour of the avatar is good.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 6)	The interaction with the avatar is good.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 7)	The speech of the avatar is good.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 8)	The avatar looks like a partner who can support me (like a friendly/likable care person).	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 9)	The avatar acts like a real human.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 10)	The text provided in the screens is readable.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 11)	I like the colours used in the screens.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 12)	The interface is clear to understand.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 13)	I don't notice any inconsistencies in the interface as I use the system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 14)	The screen elements (buttons, icons, etc.) have the adequate size.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 15)	The colours used for the different screen elements help me to understand their purpose.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 16)	The layout used for the different screen elements helps me to understand their purpose.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**

PART E – USER SATISFACTION

E 1)	I am satisfied with how easy it is to use this system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
E 2)	The system is pleasant to use.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
E 3)	The system works the way I want it to work.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
E 4)	I feel comfortable using this system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
E 5)	The interface of this system is pleasant.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
E 6)	I like using the interface of this system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
E 7)	I feel I can trust the system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
E 8)	Overall, I am satisfied with this system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**

PART F – Moral Aspects

(1) From 1 to 7, do you think that the Miraculous-Life system is:

1	2	3	4	5	6	7
Unethical			Indifferent			Ethical

(2) From 1 to 7, do you think that the Miraculous-Life system is:

1	2	3	4	5	6	7
Invasive			Indifferent			Respectful

(3) From 1 to 7, does the Miraculous-Life system make you feel:

1	2	3	4	5	6	7
Comfortable			Indifferent			Uncomfortable

(4) From 1 to 7, do you think the Miraculous-Life system is:

1	2	3	4	5	6	7
Moral			Indifferent			Immoral

(5) From 1 to 7, the Miraculous-Life system make you feel:

1	2	3	4	5	6	7
Suspicious			Indifferent			Trustful

(6) From 1 to 7, do you feel the Miraculous-Life system is:

1	2	3	4	5	6	7
Fair			Indifferent			Unfair

Thinking Aloud Data Collection:

Participant's code: _____

Coder's name: _____

Successes:

Problems encountered:

Nonverbal behavior:

Steps performed:

Time taken:

External Support required:

Learning signs:

Appendix B Trials' Evaluation Questionnaire

TRIAL EVALUATION QUESTIONNAIRE

THIS QUESTIONNAIRE IS COMPRISED OF FOUR PARTS RELATED TO THE EVALUATION OF THE MIRACULOUS LIFE SYSTEM:

PART A – SYSTEM USABILITY

PART B – EASE OF LEARNING

PART C – SYSTEM USEFULNESS

PART D – AVATAR AND INTERFACE

PART E – USER SATISFACTION

PART F – QUALITY OF LIFE

PART G – CARE DEMAND (**ONLY FOR THE CAREGIVERS**)

PART H – MORAL ASPECTS

PLEASE ANSWER TO ALL THE PARTS OF THIS QUESTIONNAIRE. THE PURPOSE IS TO ASSESS THE EXTENT TO WHICH YOU ARE SATISFIED WITH THE MIRACULOUS-LIFE SYSTEM.

IN PARTS A TO E, PLEASE NOTE THE EXTENT TO WHICH YOU AGREE WITH EACH OF THE STATEMENT PROVIDED. NUMBER **-3** REPRESENTS THE STATEMENT "STRONGLY DISAGREE" AND **+3** "STRONGLY AGREE". MORE SPECIFICALLY:

-3 - STRONGLY DISAGREE

-2 - TEND TO DISAGREE

-1 - SLIGHTLY DISAGREE

0 - INDIFFERENT

+1 - SLIGHTLY AGREE

+2 - TEND TO AGREE

+3 - STRONGLY AGREE

IN PART F, PLEASE NOTE THE EXTENT TO WHICH YOU AGREE WITH EACH OF THE STATEMENT PROVIDED. NUMBER **-2** REPRESENTS THE STATEMENT "VERY POOR" AND **+2** "VERY GOOD". MORE SPECIFICALLY:

-2 - VERY POOR

-1 - POOR

0 - FAIR

+1 - GOOD

+2 - VERY GOOD

IN PART G, PLEASE NOTE THE EXTENT TO WHICH YOU AGREE WITH EACH OF THE STATEMENT PROVIDED. NUMBER **0** REPRESENTS THE STATEMENT "NEVER" AND **4** "NEARLY ALWAYS". MORE SPECIFICALLY:

0 - NEVER

1 - RARELY

2 - SOMETIMES

3 - QUITE FREQUENTLY

4 - NEARLY ALWAYS

IN PART H, PLEASE PROVIDE YOUR OPINION ON THE STATEMENTS REGARDING THE MORAL ASPECTS OF THE SYSTEM.

THIS QUESTIONNAIRE IS ANONYMOUS AND ALL QUESTIONNAIRES WILL BE HELD SECURELY AND CONFIDENTIALLY.

THANK YOU VERY MUCH FOR YOUR PARTICIPATION.

Participant's code: _____

Coder's name: _____

PART A – SYSTEM USABILITY

A 1)	I think that I would like to use this system frequently.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
A 2)	I found the system unnecessarily complex.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
A 3)	I thought the system was easy to use.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
A 4)	I think that I would need the support of a technical person to be able to use this system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
A 5)	I found the various functions in this system were well integrated.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
A 6)	I thought there was too much inconsistency in this system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
A 7)	I would imagine that most people would learn to use this system very quickly.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
A 8)	I found the system very cumbersome to use.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
A 9)	I felt very confident using the system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
A 10)	I needed to learn a lot of things before I could get going with this system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**

PART B – EASE OF LEARNING

B 1)	It is easy to learn to use the system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
B 2)	I learned to use the system quickly.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
B 3)	I easily remember how to use the system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
B 4)	Performing tasks is always straightforward.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
B 5)	I quickly became skilful with the system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**

PART C – SYSTEM USEFULNESS

C 1)	The system helps me to be more effective in carrying out my daily activities.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 2)	The system gives me more control over the activities/tasks in my daily life.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 3)	The system makes me feel less stress by making use of the system for managing my daily activities/tasks.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 4)	The system helps me to complete my daily activities/tasks quickly.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 5)	The system helps me to complete my daily activities/tasks more easily.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 6)	The system makes me feel more motivated to carry out my daily activities/tasks.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 7)	The system makes me feel safer in carrying out my daily activities/tasks.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 8)	The system helps me be more active (i.e., participate in more activities).	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 9)	The system improves my ability to perform my daily activities/tasks.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 10)	The system helps me be more independent/autonomous.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 11)	The system helps me to reduce my demand for care from my caregivers.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 12)	The system saves me time when I use it.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
C 13)	I find pleasure carrying out my daily activities/tasks by using the system.	**Strongly Agree**	+3	+2	+1	0	-1	-2	-3	**Strongly Disagree**
C 14)	I am interacting and socializing more with my friends/family by using the system.	**Strongly Agree**	+3	+2	+1	0	-1	-2	-3	**Strongly Disagree**

PART D – AVATAR AND INTERFACE

D 1)	The overall interface is good.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 2)	The appearance of the avatar is good.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 3)	The (style of) movements of the avatar are good.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 4)	The facial expression of the avatar is good.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 5)	The behaviour of the avatar is good.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 6)	The interaction with the avatar is good.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 7)	The speech of the avatar is good.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 8)	The avatar looks like a partner who can support me (like a friendly/likable care person).	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 9)	The avatar acts like a real human.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 10)	The text provided in the screens is readable.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 11)	I like the colours used in the screens.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 12)	The interface is clear to understand.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 13)	I don't notice any inconsistencies in the interface as I use the system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 14)	The screen elements (buttons, icons, etc.) have the adequate size.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 15)	The colours used for the different screen elements help me to understand their purpose.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 16)	The layout used for the different screen elements helps me to understand their purpose.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 17)	The avatar created a sense of closeness with me.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 18)	I felt close to the avatar.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 19)	I found the avatar to be very detached from me.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
D 20)	The avatar was very impersonal in its dealings with me.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**

D 21) The avatar understood what I wanted.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
D 22) The avatar understood what I was trying to do.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
D 23) The avatar understood my emotions.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
D 24) The avatar is likeable.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
D 25) The avatar is friendly.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
D 26) The avatar is fun.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
D 27) I have positive feelings about the avatar.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**
D 28) The avatar holds my attention.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3	**Strongly Agree**

PART E – USER SATISFACTION

E 1)	I am satisfied with how easy it is to use this system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
E 2)	The system is pleasant to use.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
E 3)	The system works the way I want it to work.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
E 4)	I feel comfortable using this system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
E 5)	The interface of this system is pleasant.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
E 6)	I like using the interface of this system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
E 7)	I feel I can trust the system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**
E 8)	This system has all the functions and capabilities I expect it to have.	**Strongly Agree**	+3	+2	+1	0	-1	-2	-3 **Strongly Disagree**
E 9)	I am satisfied with the overall functionality of the system.	**Strongly Agree**	+3	+2	+1	0	-1	-2	-3 **Strongly Disagree**
E 10)	I think that I would like to use this system frequently.	**Strongly Agree**	+3	+2	+1	0	-1	-2	-3 **Strongly Disagree**
E 11)	Overall, I am satisfied with this system.	**Strongly Disagree**	-3	-2	-1	0	+1	+2	+3 **Strongly Agree**

PART F – Quality of Life

TAKING EVERYTHING INTO CONSIDERATION, DURING THE PAST WEEK HOW SATISFIED HAVE YOU BEEN WITH YOUR...

F 1)	...physical health?	**Very Poor**	-2	-1	0	+1	+2	**Very Good**
F 2)	...mood?	**Very Poor**	-2	-1	0	+1	+2	**Very Good**
F 3)	...household activities?	**Very Poor**	-2	-1	0	+1	+2	**Very Good**
F 4)	...social relationships?	**Very Poor**	-2	-1	0	+1	+2	**Very Good**
F 5)	...family relationships?	**Very Poor**	-2	-1	0	+1	+2	**Very Good**
F 6)	...leisure time activities?	**Very Poor**	-2	-1	0	+1	+2	**Very Good**
F 7)	...ability to function in daily life?	**Very Poor**	-2	-1	0	+1	+2	**Very Good**
F 8)	...ability to get around physically without feeling dizzy or unsteady or falling?	**Very Poor**	-2	-1	0	+1	+2	**Very Good**
F 9)	...overall sense of wellbeing?	**Very Poor**	-2	-1	0	+1	+2	**Very Good**
F 10)	...overall life satisfaction and contentment during the past week?	**Very Poor**	-2	-1	0	+1	+2	**Very Good**

PART G – Care Demand

G 1)	Do you feel that the person under your care asks for more help than he/she needs?	**Never**	0	1	2	3	4 **Nearly Always**
G 2)	Do you feel that because of the time you spend with the person under your care that you don't have enough time for yourself?	**Never**	0	1	2	3	4 **Nearly Always**
G 3)	Do you feel stressed between caring for the person you look after and trying to meet other responsibilities for your family or work?	**Never**	0	1	2	3	4 **Nearly Always**
G 4)	Do you feel angry when you are around the person under your care?	**Never**	0	1	2	3	4 **Nearly Always**
G 5)	Are you afraid what the future holds for the person under your care?	**Never**	0	1	2	3	4 **Nearly Always**
G 6)	Do you feel that the person under your care is dependent on you?	**Never**	0	1	2	3	4 **Nearly Always**
G 7)	Do you feel strained when you are around the person under your care?	**Never**	0	1	2	3	4 **Nearly Always**
G 8)	Do you feel your health has suffered because of your involvement with the person under your care?	**Never**	0	1	2	3	4 **Nearly Always**
G 9)	Do you feel that you don't have as much privacy as you would like because of the person under your care?	**Never**	0	1	2	3	4 **Nearly Always**
G 10)	Do you feel that your social life has suffered because you are caring for the person under your care?	**Never**	0	1	2	3	4 **Nearly Always**
G 11)	Do you feel that the person under your care seems to expect you to take care of him/her as if you were the only one he/she could depend on?	**Never**	0	1	2	3	4 **Nearly Always**
G 12)	Do you feel that the cost of caring for the person you look after is unwarrantably high?	**Never**	0	1	2	3	4 **Nearly Always**
G 13)	Do you feel that you will be unable to take care of the person under your care much longer?	**Never**	0	1	2	3	4 **Nearly Always**
G 14)	Do you wish you could leave the care of the person you look after to someone else?	**Never**	0	1	2	3	4 **Nearly Always**

PART H – Moral Aspects

(1) From 1 to 7, do you think that the Miraculous-Life system is:

1	2	3	4	5	6	7
Unethical			Indifferent			Ethical

(2) From 1 to 7, do you think that the Miraculous-Life system is:

1	2	3	4	5	6	7
Invasive			Indifferent			Respectful

(3) From 1 to 7, does the Miraculous-Life system make you feel:

1	2	3	4	5	6	7
Comfortable			Indifferent			Uncomfortable

(4) From 1 to 7, do you think the Miraculous-Life system is:

1	2	3	4	5	6	7
Moral			Indifferent			Immoral

(5) From 1 to 7, the Miraculous-Life system make you feel:

1	2	3	4	5	6	7
Suspicious			Indifferent			Trustful

(6) From 1 to 7, do you feel the Miraculous-Life system is:

1	2	3	4	5	6	7
Fair			Indifferent			Unfair

Appendix C Selection Questionnaire

A. Personal information

A0. Participant's code: _____

A1. Gender:

☐ Male ☐ Female

A2. Age: _____

A3. Profession: _____

A4. Nationality: _____

B. Health status

B1. Do you have hearing problems?

☐ Yes ☐ No

B2. Do you have vision problems?

☐ Yes ☐ No

B3. Do you suffer from colour blindness?

☐ Yes ☐ No

B4. Are you taking daily medication?

☐ Yes ☐ No

B5. Do you have memory problems in everyday life?

☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Very often ☐ Always

B6. Do you have trouble concentrating?

☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Very often ☐ Always

C. Knowledge and experience with computing

C1. Do you have a computer?

☐ Yes ☐ No

C2. Do you have a tablet?

☐ Yes ☐ No

C3. Do you have a smartphone?

☐ Yes ☐ No

C4. Do you have an internet connection?

☐ Yes ☐ No

C5. Level of experience with the use of the computer:

☐ No experience ☐ A little ☐ Average ☐ Advanced ☐ Expert

C6. Level of experience with the use of a tablet:

☐ No experience ☐ A little ☐ Average ☐ Advanced ☐ Expert

C7. Level of experience with the use of a smartphone:

☐ No experience ☐ A little ☐ Average ☐ Advanced ☐ Expert

C8. Level of experience with the use of internet:

☐ No experience ☐ A little ☐ Average ☐ Advanced ☐ Expert

D. Attitude towards technology

D1. I am confident that I can learn new technologies.

Strongly Agree	Tend to Agree	Slightly Agree	Indifferent	Slightly Disagree	Somewhat Disagree	Don't Agree
☐	☐	☐	☐	☐	☐	☐

D2. I feel apprehensive about using new technologies.

Strongly Agree	Tend to Agree	Slightly Agree	Indifferent	Slightly Disagree	Somewhat Disagree	Don't Agree
☐	☐	☐	☐	☐	☐	☐

D3. Anyone can learn to use new technologies if they are patient and motivated.

Strongly Agree	Tend to Agree	Slightly Agree	Indifferent	Slightly Disagree	Somewhat Disagree	Don't Agree
☐	☐	☐	☐	☐	☐	☐

D4. You have to be a genius to successfully use new technologies.

Strongly Agree	Tend to Agree	Slightly Agree	Indifferent	Slightly Disagree	Somewhat Disagree	Don't Agree
☐	☐	☐	☐	☐	☐	☐

D5. In the near future, I would use new technologies daily.

Strongly Agree	Tend to Agree	Slightly Agree	Indifferent	Slightly Disagree	Somewhat Disagree	Don't Agree
☐	☐	☐	☐	☐	☐	☐

D6. New technologies scare me.

Strongly Agree	Tend to Agree	Slightly Agree	Indifferent	Slightly Disagree	Somewhat Disagree	Don't Agree
☐	☐	☐	☐	☐	☐	☐

D7. Learning to operate new technologies is like learning any new skill – the more you practice, the better you become.

Strongly Agree	Tend to Agree	Slightly Agree	Indifferent	Slightly Disagree	Somewhat Disagree	Don't Agree
☐	☐	☐	☐	☐	☐	☐

D8. I am worried about the use of new technologies.

Strongly Agree	Tend to Agree	Slightly Agree	Indifferent	Slightly Disagree	Somewhat Disagree	Don't Agree
☐	☐	☐	☐	☐	☐	☐

Appendix D Objective and Indicator Associations With the Questionnaires

D.1. Objectives and Indicator Associations for the Pre-Trial Questionnaire

Objectives	*Indicators*	*Associated Questions*
Objective 1	**Indicator 1**	A8 (Negative Score*), C4, C5, C12.
	Indicator 2	A1, A2 (Negative Score), A3, A4 (Negative Score), A5, A6 (Negative Score), A8 (Negative Score), A10 (Negative Score), C1, C2, C3, C6, C7, C8.
Objective 2	**Indicator 1**	D5, D6, D8, D9.
	Indicator 2	NOT APPLICABLE FOR PRE-TRIALS. This indicator will be extracted automatically by the system by considering the number of activities the elderly is subscribed though the life time of the project.
Objective 3	**Indicator 1**	A5, A6 (Negative Score), A7, A9, A10 (Negative Score), B1, B2, B3, B4, B5, C3, C4, C5, D4, D5, D6, D7, D8, D9, D12, D14, D15, D16, E1, E2, E3, E4, E5, E6, E7, E8.
Objective 4	**Indicator 1**	C1, C2, C4, C9.
	Indicator 2	C11. NOT APPLICABLE FOR PRE-TRIALS. This indicator will be extracted automatically by the system by considering the number of support alerts/messages produced by the system.
	Indicator 3	C2, C3, C7, C8, C10.
Objective 5	**Indicator 1**	NOT APPLICABLE FOR PRE-TRIALS. This indicator will be extracted automatically by the system by considering the number of exchanged messages between the VCT members and activities performed with the VCT members though the life time of the project.
	Indicator 2	C11. NOT APPLICABLE FOR PRE-TRIALS.
	Indicator 3	NOT APPLICABLE FOR PRE-TRIALS.
Objective 6	**Indicator 1**	A2 (Negative Score), A3, D1, D2, D3, D10, D11, D12, D13, E1, E3, E4, E6, E7.

**** Negative Score: A low rating in a question with negative score corresponds to a better evaluation for the system. Thus the numeric scale for these questions should be reversed.***

D.2. Objectives and Indicator Associations for the Trial Questionnaire

Objectives	*Indicators*	*Associated Questions*
Objective 1	**Indicator 1**	A8 (Negative Score*), C4, C5, C12. This indicator will be also extracted automatically by the system by considering the time spend for each service the elderly uses though the life time of the project.
	Indicator 2	A1, A2 (Negative Score), A3, A4 (Negative Score), A5, A6 (Negative Score), A8 (Negative Score), A10 (Negative Score), C1, C2, C3, C6, C7, C8, D24, D25, D26, D27, D28, E10.
Objective 2	**Indicator 1**	D5, D6, D8, D9, D17, D18, D19 (Negative Score), D20 (Negative Score), D21, D22, D23.
	Indicator 2	This indicator will be extracted automatically by the system by considering the number of activities the elderly is subscribed though the life time of the project.
Objective 3	**Indicator 1**	A5, A6 (Negative Score), A7, A9, A10 (Negative Score), B1, B2, B3, B4, B5, C3, C4, C5, D4, D5, D6, D7, D8, D9, D12, D14, D15, D16, D20 (Negative Score), D27, D28, E1, E2, E3, E4, E5, E6, E7, E11.
Objective 4	**Indicator 1**	C1, C2, C4, C9, C13.
	Indicator 2	C11. This indicator will be extracted automatically by the system by considering the number of support alerts/messages produced by the system.
	Indicator 3	C2, C3, C7, C8, C10. F1, F2, F3, F4, F5, F6, F7, F8, F9, F10.
Objective 5	**Indicator 1**	C14. This indicator will be also extracted automatically by the system by considering the number of exchanged messages between the VCT members and activities performed with the VCT members though the life time of the project.
	Indicator 2	C11, G1, G2, G6, G9, G10, G11, G12, G14 (Negative Score).
	Indicator 3	G2, G3, G4, G5, G7, G8, G11, G13, G14.
Objective 6	**Indicator 1**	A2 (Negative Score), A3, D1, D2, D3, D10, D11, D12, D13, E1, E3, E4, E6, E7, E8, E9,

**** Negative Score: A low rating in a question with negative score corresponds to a better evaluation for the system. Thus the numeric scale for these questions should be reversed.***