



VictoryaHome – AAL-2012-5-228

A robot for integrated care at home and peace of mind
for caregivers

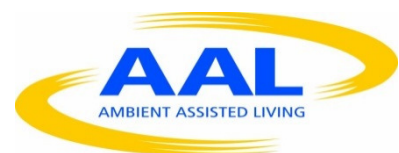
Deliverable

D3.1 User evaluation strategy

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Executive Summary

This deliverable describes the user requirements elicitation and evaluation strategy for the different phases in VictoryaHome. In total, five main phases are laid out for the user evaluation strategy throughout the project, ranging from building up insight using interviews, contextual inquiries and low fidelity prototypes to long term testing in people's own homes. In each phase, multiple stakeholders are involved to create a richer and more complete understanding of the entire value chain and ecosystem of care delivery that VictoryaHome strives to serve. For each phase, this deliverable will be updated according to progressive insight during the iterative design process. The evaluation is not performed in isolation; close links are established with the development team, the business strategy team and the work on care processes.

We will conduct studies that enable cross-cultural comparison of issues as well, as we hope to design for diversity and inclusivity. To understand and ensure that the research questions can be addressed positively, we need to not only investigate the older adult, but also the context of their daily living, their environment – including other people and the (material) world around them. Therefore a stakeholder approach is taken and part of the work is carried out in the homes of the older adults.

During the VictoryaHome project, and in the scope of Work Package 3, the User Centred Design and Usability Testing activities employ a number of methods, techniques and tools. The User Evaluation Strategy defines the workflow for the use of the methods, techniques and tools used in the project; it also includes their descriptions and some examples of use, providing an integrated view of the project development process. The User Evaluation Strategy has the objective of producing a specification of user requirements, which will be used to guide the development, help producing business models and, ultimately, to shape the services created within the VictoryaHome project.

The five phases of the evaluation strategy

All target users, primary, secondary and tertiary, are involved in the five phases of the evaluation. In this approach, users are progressively involved to minimize the risks of introducing new technology. Evaluation sessions will be done in four trial countries: the Netherlands, Sweden, Norway and Portugal.

The **1st phase** aims at identifying user requirements in relation to identified project goals and the scope of the work. This will partly be done by focussing on the pains that VictoryaHome can take away, which have been identified by the consortium members, each from their own background and expert opinion, and partly by the expressed needs of participants in several focus groups. Furthermore expertise from previous research projects in the area of robotics and services for independent living will be used. Combining these perspectives will lead to a

priority list of topics to focus on while developing VictoryaHome services. These topics will be transformed into specific functional and non-functional requirements. For the focus groups, participants will be invited based upon the roles they could play relieving a specific pain.

Evaluation Strategy	2013								2014								2015								2016																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36					
	Ap	Ma	Ju	Ju	Au	Se	Oc	No	De	Ja	Fe	Ma	Ap	Ma	Ju	Ju	Au	Se	Oc	No	De	Ja	Fe	Ma	Ap	Ma	Ju	Ju	Au	Se	Oc	No	De	Ja	Fe	Ma					
Phase 1. Group sessions in controlled environment																																									
Phase 2. Individual sessions in controlled environment																																									
Phase 3. Home solution installation and testing																																									
Step 3.1. Solution introduction and setting up																																									
Step 3.2. Initial testing and configuration																																									
Step 3.3. Full functional test and deployment of improved version																																									
Step 3.4. Update to the final VictoryaHome system																																									
Phase 4. Home studies																																									
Step 4.1: Pre-testing of the final VictoryaHome system																																									
Step 4.2: Everything ready 1-2 homes per trials site																																									
Step 4.3: Total amount of VictoryaHome systems installed																																									
Phase 5. Long term user experience																																									

The 2nd phase aims at deepening the insight in the requirements collected in the first phase. Some of the requirements will be clear, while others will need further research to be fully understood. In this phase, low fidelity prototypes (e.g. mock-ups), semi-structured interviews and usability testing with the help of use cases will be used. This phase will involve small groups of users as well as individual sessions in controlled environments such as a lab or smart home.

The 3rd phase is focussing at the practical implementation of VictoryaHome. Starting point is technical feasibility testing in controlled environments. When the system has passed the test in a controlled environment, a small number of users will be involved in testing the system for the first time in actual homes. The system is taken to their homes and used both in the presence of the evaluators and without their presence.

The 4th phase aims at the real introduction of the VictoryaHome services in users' homes. This can only be done after verifying that the system is ready for the complete user trials. The procedure is carried out in 3 steps: it starts with 2 users in phase 4.1 and progressively the number of users is increased with 6 users in phase 4.2. Finally, phase 4.3 correspond to the complete user trials and the users' number will be increased gradually up to the involvement of 40 primary users. In this phase the focus is both on a *quantitative evaluation* of the VictoryaHome services based upon parameters defined per service, and on a *qualitative evaluation* of aspects like quality of life and depressive symptoms, burden of care and measurement of social presence.

The final 5th phase of the user evaluation strategy is a follow-up period where we test sustainability of solutions and observe longer-term effects. This will provide vital input for further developing the business strategy.

Glossary

AAL: Ambient Assisted Living

ADL: Activities of Daily Living

Feature: capabilities of the solution to support the use case stakeholders.

Platform: software and hardware that will result in a product once it has been prepared for a given market.

Primary end-user: the person who actually is using an AAL product or service, a single individual. In AAL this is an older adult. The group of primary end-users directly benefits from AAL by increased quality of life.

Product: a platform when ready and offered for a market.

Secondary end-users: persons or organisations directly being in contact with a primary end-user, such as formal and informal care persons, family members, friends, neighbours, care organisations and their representatives. This group benefits from AAL directly when using AAL products and services (at a primary end-user's home or remote) and indirectly when the care needs of primary end-users are reduced.

Service: a set of procedures, workflows and one or more products.

Service solution: a service to be delivered for a specific customer.

Tertiary end-users: are such institutions and private or public organisations that are not directly in contact with AAL products and services, but who somehow contribute in organizing, paying or enabling them. This group includes the public sector service organizers, social security systems, insurance companies. Common to these is that their benefit from AAL comes from increased efficiency and effectiveness which result in saving expenses or by not having to increase expenses in the mid and long term.

UCD: User-centred design

UML: Unified Modelling language

VictoryaHome system: the platform developed during the VictoryaHome project.

VictoryaHome solutions: a set of service solutions. This is finally what will be created, tested and marketed in the VictoryaHome project. It consists of the VictoryaHome system, a platform which is customisable to be offered to different markets in Europe and a service strategy including procedures and workflows to adapt the platform to specific identified customers (details on the service strategy will be reported in WP2).

1 Introduction

What if at Irene's home there was an avatar that "knows" what is happening with her in the house and shares this knowledge with her carers? It does not tell all it knows, but will let them know when there might be a problem. The avatar is aware about its user, if she took medication and if her activity level is OK. It also knows if she has fallen down and can automatically call someone to help. At this stage the carer can come in the house "virtually" using the tele-presence function. The key advantage of this platform is that it does not depend wholly on automated functions, but augments them with immediate human presence when needed or desired by the older adult user.

VictoryaHome is not only about responding to specific problems, but mainly promotes self-care and allows the carers to know that everything is fine and stay informed regarding key status indicators and activities. As a result the carers will feel greater confidence.

Four large trials will take place in Norway, Sweden, the Netherlands and Portugal, where older adults at home and remote informal carers will interact with the developed product. This will provide a comprehensive coverage of the European context, namely northern, central and southern Europe.

Innovation in the project is built on previous results: a fully tested robot for tele-presence, scientific evidence from a medication adherence system, and a reliable activity monitoring personal device. All of these are already on the market. Quick development phases mean that users can start using the technology with a functional prototype in year one of the project. A key element of this proposal is long-term deployment to get past the "novelty" phase of new technology introduction and assess its true value in assisting older adults and their caregivers. The users will lead a participatory design process. Users are involved right from the start of the project and in 6 months will be exposed to the solution at their home. At the beginning of year 2 we start the trials, where functioning prototypes will be tested on-site (homes of the older adults and carers). This strategy of early testing, together with a continuous and incremental development of features (release early, release often) will promote a longer exposure of the participating users to the technology and will open the possibilities of a reduced time to market: expected 12 months after the end of the project.

1.1 Example scenario

Helen is 75 and has mild dementia. She is sitting at home watching her favourite program on TV. She forgets to take her medicine. At this point the VictoryaHome robot changes the screen to show the notice of the missed medication. Helen is focused on the TV, so she does not notice the reminder. After a short time, VictoryaHome sounds a soft alarm to remind Helen of her medication. Integrated on VictoryaHome, there is a medication dispenser, so Helen can easily get her medication.

Had she not heard the alarm, VictoryaHome would have changed the state of the “serenity button”, an App running on her carers’ smartphones, to yellow. If this had happened, one of her carers – her husband for example - could initiate a tele-presence session to Helen’s home, by navigating remotely to her and asking if she is OK. And if all is fine, he could then tell her to take the medication, which she can pick herself directly from the VictoryaHome dispenser.



Figure 1. *The Giraff*

The main objective of the project is to a) support older adults at home in their daily activities, and b) support their informal carers such as family and friends. A service approach is to be followed that moves away from a purely technological view to one where technology is an ingredient but also are the stakeholders (users, both informal and professional caregivers, care providers, financing institutions, policy makers, etc.) and the integration between systems and other services.

1.2 The aimed services

VictoryaHome steps up from “video-conference on wheels” (which is already available in the market and possible to use at home) into a full “care on wheels” solution. The existing Giraff avatar (see Figure 1) and the new smartphone app are the basic supporting mechanisms to achieve a complete new platform for mobile help and care to the older adults. However, the project aims at much more than helping the older adults with formal carers. It also focuses on the informal carers, the family, the friends, and those close to the older adults with the burden of giving daily care the best they can, taking energy and time from their already busy life. For the first time they will be supported by ICT to give care from a distance, with the help of specially designed tools such as medication adherence, activity monitoring and fall

detection, and a video communication mechanism, which until now has only been available on PCs and sometimes mobile phones. Never before have these tools been simultaneously accessed by both sides (end-user and caregiver), as VictoryaHome will permit. And most importantly is the feedback given by the older adults empowered by ICT: they will be able to give back some help to her or his carers network, so that the carers can better take care of them. In interacting with the robot, for example using the medication module, the older adults will be providing the necessary information to the formal carers and also informal carers so they know about his or her condition, health status and well-being.

The project uses the basic platform offered by the Giraff, i.e. the physical structure including the skeleton, the locomotion equipment motors and steering structure and the tele-presence features. Building on top of an existing platform helps overcome time consuming tasks of developing and testing pure mechanics and communications, and instead puts the focus immediately on the key objectives and targets of the VictoryaHome project, i.e. the development of total solutions for care at home.

Both older adults and their informal carers will profit from this project. We believe the care organization also benefits, perhaps greatly because if the informal caregivers are able to assist with care in a meaningful way, this reduces the care burden and cost by the care organization.

2 Methodologies

In this section, we present the methodologies and materials that will be used in each of the evaluation phases¹. For each phase a complete set of documentation materials will be produced to support the teams carrying out the evaluation tasks in each pilot site in Norway, Sweden, Portugal and The Netherlands. These included general instructions for the evaluation teams, user session materials such as questionnaires or storyboards, user manuals, and templates for results reporting.

Below is a brief description of each phase and a simple list of the documentation materials used in each one of the phases. Note that for every phase, all these materials have been created in English and after approval translated in Norwegian, Swedish, Portuguese and Dutch.

2.1 Evaluation Phase 1

Description: Group sessions in controlled environment.

Aim: Identification of the user requirements in relation to identified project goals and the scope of the work.

Participants: 3-5 sessions per country covering ideally all 5 groups: a group with older adults, a group with informal carers, a group with formal carers, a mixed group with older adults/informal carers, a mixed group with informal carers/formal carers.

Process: As a result of the focus group sessions with the users a priority list of topics to focus on when developing VictoryaHome services will be obtained. These topics will be transformed into specific functional and non-functional requirements.

Materials:






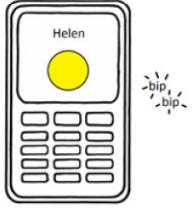


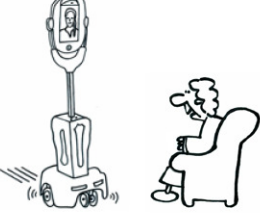
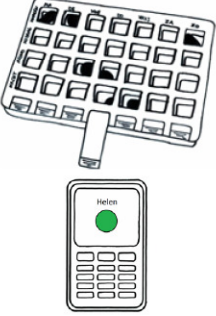
Instructions	Session support	Reporting templates
Briefing text for recruiting participants	Focus group script	Reporting sheet for observation, quotes and notes
Introduction of the project during the sessions	Informed consent	
Reporting instructions	Pre-session questionnaire for all participants	

¹ Due to their extension, only the list of used documentation materials and some samples are included in this report. The complete materials may be obtained upon request sent to the coordinator of the project.

	Materials to be used during the sessions (stories, video & cartoon*)	
	Focus group questions: five sets of questions (one set per participant group type)	

*example below

Example: One of the cartoons used during focus group sessions (Evaluation phase 1).

				
Helen is 75 and has mild dementia. She is sitting at home watching TV.	Her husband Per is in good physical condition and is out of the house fishing.	Helen forgets to take her medicine.	After a couple of minutes, the VictoriaHome robot changes the screen to show a medication reminder...	...but Helen is focused on the TV, so she does not notice the reminder.
				
VictoriaHome now changes the state of the "serenity button" to yellow. Therefore, a warning sound comes from Per's mobile phone.	Per pushes the "serenity button" to see what is going on.	He decides to call their daughter Amber to ask her to check on mum.	Amber decides to perform a remote visit using VictoriaHome. Helen greets her daughter, they have a chat, and she takes her medication. Amber tells her that Per will be at home soon and then says goodbye	The pill-box tells VictoriaHome that her medicine has been taken and VictoriaHome changes the "serenity button" of the carers to green

2.2 Evaluation Phase 2

Description: Individual sessions in controlled environment.

Aim: The 2nd phase aims at deepening the insight in the requirements collected in the first phase.

Participants: 6 persons per test site. That is, 2 informal carers, 2 formal carers and 2 older adults.

Process: In this phase, low fidelity prototypes (e.g. mock-ups), semi-structured interviews and usability testing with the help of use cases will be used. This phase will involve small

groups of users as well as individual sessions in controlled environments such as a lab or smart home.

Materials:

Instructions	Session support	Reporting templates
Description of interview procedure*	Informed consent	Observation sheet
Briefing text for recruitment	Pre-session questionnaire for all participants	
Reporting instructions	Interview materials*	

**examples below*

Example 1: Schedule of the interviews (included in the document "Description of the interview procedure").

Time	Action	Who
-1:00	Preparing the room, materials, demos, etc.	Interviewer, note takers
0:00	Welcome, coffee, tea	Interviewer, note takers
0:05	Introduction of the participant and the project (P2.1)	All
0:10	Signing the informed consent form (P2.2)	Participant
0:12	Filling in the pre-session questionnaire (P2.3)	Participant
0:20	Interaction task by the participant. Scripts file (P2.4)	Interviewer leads, note takers record all observation, thoughts, , quotes, and notes on a paper (or laptop) Participant and 4th researcher play role of users.
0:40	Dialogue with questions (P2.5)	Interviewer, note takers records additional comments from the participants
1:00	Wrap up, thank you gift, goodbye	Interviewer

Example 2: A part of the mock-up for the VictoryaHome Mobile App.



These mock-ups consist of PowerPoint presentations with hyperlinks associated to each interactive item on the screen. The presentations were shown to the users on a device featuring a touch screen. This way, any time the user touched an item with a hyperlink, the slide would change to the next interaction state. This way the user gets the impression of being in interaction with a functional interface. The full mock-up includes 45 different slides representing as much possible states in the app.

2.3 Evaluation Phase 3

Description: Home solution installation and testing.

Aim: Technical feasibility testing at users' homes. The system is taken to the older adult homes and used in the presence of the evaluators.

Participants: 3 persons per test site: 1 older adult, 1 Informal carer, 1 response centre employee.

Process: Real world testing with a walkthrough of pre-determined use scenarios. At least one researcher per test site will take the VictoryaHome system into a user's home, setup the system and ask the user to perform the scenarios. One researcher has the lead, explains, and guides the user if needed (the residence wizard). The other researcher(s) observe and take notes of actions, comments, behaviour, etc. If all goes well, the system will already stay in the users' homes for 1 to 2 weeks.

Materials:

Instructions	Session support	Reporting templates
List of devices	Informed consent	Observation sheet
Procedure description*	Pre-session questionnaire for all participants	
Time schedule and logistics		
Reporting instructions		

**example below*

Example: Procedure description for evaluation phase 3.

1. Management of the VH system (before testing)	<ul style="list-style-type: none"> a) Configure wireless router according to VH Router Configuration b) Install VH smart phone application c) Attach carrying tray on Giraff d) Personalize the VH system with included instructions for "Personalize the VH system"
2. Test that everything works (before testing)	a) It is recommended to go through the installation and execution steps below and make sure everything works in a controlled environment before taking the equipment to the user's home
3. Preparer informal caregiver (before or in connection with tests)	a) Go through the script
4. Prepare response centre (before or in connection with tests)	a) Go through the script
5. Installation in the residence	<ul style="list-style-type: none"> a) Test the network in the home with the "Synthetic" test using a laptop, instructions can be found in Giraff Wireless Network Connection Testing Guide b) Test the environment in the home with the Giraff Home Environment Testing Guide

	<ul style="list-style-type: none"> c) Install the router (no instructions provided, assumes you know this) d) Install the Giraff (no instructions provided, assumes you know this) e) Activate and ask the resident to attach the fall detector using included instructions for "Activate Fall Detector"
6. Execution of the tests (1)	<ul style="list-style-type: none"> a) Explanation of project and tests b) Signing of informed consent c) Pre-test questionnaire d) Pre-test interview e) Execute the trails using the Resident and/or Informal Carer Scripts. f) Short interview about each scenario
7. Execution of the tests (2) (5 to 10 days after the first session)	<ul style="list-style-type: none"> a) Longer interview on their experience and usability of the system b) Concept Mapping exercise
8. Post-tests actions	<ul style="list-style-type: none"> a) Remove personal data. To remove personal data simply use the included instructions b) Collect forms and answers c) Create report

2.4 Evaluation Phase 4

Description: Home studies.

Aim: Introduction of the VictoryaHome services in users' homes.

Participants: 50 older adults, informal carers (at least one per older adult, no limit), formal carers, response centres employees.

Process: The procedure is carried out in 3 steps: it starts with 2 users in phase 4.1 and progressively the number of users is increased with 6 users in phase 4.2. Finally, phase 4.3 correspond to the complete user trials. More detail will follow in the deliverable D3.3 Study Protocol.

Materials:

Instructions	Session support	Reporting templates
User manuals	Intake forms / checklists	Self-reporting forms
Measurements and schedule*	Informed consent	
Reporting instructions	Interview questions	

*example below

Example: Schedule of the home visits (table 1) and overview of all the measurements to be obtained during the visits organized per hypothesis (table 2) and per visit (table 3).

User	M0	M1	M2	M3	M4	M5	M6	M7	M8	
	Inclusion	Control		Intervention						
Primary	v0	v1	v2	v3	v4	v5	-	v7	-	v8
Secondary (informal)		v1	v2		v4	v5	-	v7	-	v8
Secondary (formal)	v0	-	-	v3	-	v6	-	-	-	v8

Table 1. Overview of visits.

Hypotheses	Measurement	Type	Source	Primary	Family	Professional	When
-	Consent form	Questionnaire	VH specific	X	X	X	v0
-	Socio-demographic data form	Questionnaire	VH specific	X	X	-	v0
1.1, 2.1	PIADS – Psycho-social Impact of Assistive Devices Scale	Questionnaire	Jutai 2002	X	X	-	v8
1.2, 1.3	Peace of mind – PoM	Interview	VH specific	X	X	-	v2 + v7
1.4	Caregiver Burden Scale – CBS	Questionnaire	Zarit 1980	-	X	-	v1 + v5 + v8
1.5	Lubben Social Network Scale – LSNS	Questionnaire	Lubben 2006	X	-	-	v2 + v7
1.5	Diary 1, 2, 3, 4	Diary	VH specific	X	X	-	Continuously
1.6	IPO Social Presence Questionnaire	Questionnaire	De Greef 2001	X	-	-	v5 + v8
1.7	UCLA Perceived Loneliness Scale	Questionnaire	Russell 1980	X	-	-	v1 + v5 + v8
1.8	Physical Activity Scale for the Elderly – PASE	Questionnaire	Washburn 1993	X	-	-	v2 + v7
1.8	Physical Activity	Logging	Belt-clip	X	-	-	Continuously
2.1, 1.5	Virtual Visits	Logging	Giraff	X	X	X	Continuously
2.2	Self-Management Abilities Scale – SMAS	Questionnaire	Schuermans 2005	X	-	-	v1 + v5 + v8
2.2	Medication adherence	Logging	Pillbox	X	-	-	Continuously
3.1, 3.2	Safety and Security – SaS	Interview	VH specific	X	X	-	v2 + v7
3.3	Falls Detected	Logging	Belt-clip	X	-	-	Continuously
4.1	MSPSS – Perceived Social Support	Questionnaire	Zimet 1988	X	-	-	v1 + v5 + v8
4.2	Cooperation between Caregivers – CoC	Interview	VH specific	-	X	X	v8
4.3	Attractiveness of Care Profession – ACP	Interview	VH specific	-	X	X	v8
5.1	System Usability Scale – SUS	Questionnaire	Sauro & Lewis 2012	X	X	X	v6 / v7
5.2	Almere Model on Robot Acceptance – AMRA	Questionnaire	Heerink 2010	X	-	-	v2 + v7
5.3, 5.4	Unified theory of acceptance and use of technology – UTAUT	Questionnaire	Venkatesh 2003	-	X	X	v6 / v7

Table 2. Overview of measurements.

Visit	Measurement	Type	Source	Primary	Family	Professional
v0	Consent form	Questionnaire	VH specific	X	X	X
	Socio-demographic data form	Questionnaire	VH specific	X	X	-
v1	Diary 1 + 2	Diary	VH specific	X	X	-
v1 + v5 + v8	Caregiver Burden Scale – CBS	Questionnaire	Zarit 1980	-	X	-
	UCLA Perceived Loneliness Scale	Questionnaire	Russell 1980	X	-	-
	Self-Management Abilities Scale – SMAS	Questionnaire	Schuurmans 2005	X	-	-
	MSPSS – Perceived Social Support	Questionnaire	Zimet 1988	X	-	-
	IPO Social Presence Questionnaire (not in v1)	Questionnaire	De Greef 2001	X	-	-
v2 + v7	Peace of mind – PoM	Interview	VH specific	X	X	-
	Lubben Social Network Scale – LSNS	Questionnaire	Lubben 2006	X	-	-
	Physical Activity Scale for the Elderly – PASE	Questionnaire	Washburn 1993	X	-	-
	Safety and Security – SaS	Interview	VH specific	X	X	-
	Almere Model on Robot Acceptance – AMRA	Questionnaire	Heerink 2010	X	-	-
v3	Diary 3 + 4	Diary	VH specific	X	X	-
v6	System Usability Scale – SUS	Questionnaire	Sauro & Lewis 2012	-	-	X
	Unified theory of acceptance and use of technology – UTAUT	Questionnaire	Venkatesh 2003	-	-	X
v7	System Usability Scale – SUS	Questionnaire	Sauro & Lewis 2012	X	X	-
	Unified theory of acceptance and use of technology – UTAUT	Questionnaire	Venkatesh 2003	-	X	-
v8	PIADS – Psycho-social Impact of Assistive Devices Scale	Questionnaire	Jutaj 2002	X	X	-
	Cooperation between Caregivers – CoC	Interview	VH specific	-	X	X
	Attractiveness of Care Profession – ACP	Interview	VH specific	-	X	X

Table 3. Overview of measurements per visit.

2.5 Evaluation Phase 5

Description: Long-term user experience.

Aim: Follow-up period to test the sustainability of solutions and observe longer term effects.

References

For all phases

- Information Letter
- Informed Consent Form
- Intake Questionnaire

For phase 1

- Evaluation Phase 1 Guidelines
- Extended Documentation & Interview Templates
- VictoryaHome Phase 1 Cartoons
- VictoryaHome Phase 1 Video
- Reporting template User Sessions phase 1
- Coding scheme questionnaire phase 1

For phase 2

- Phase 2 Documentation & Templates
- VictoryaHome Phase 2 Mock-ups
 - Mobile App Mock-up
 - Giraff App Mock-up
 - Dashboard Mock-up
- Heuristic Evaluation of VictoryaHome apps

For phase 3

- Phase 3 Full Procedure Overview
- Phase 3 Interview Guide
- Phase 3 Test Observation Sheets & Interview Questions
 - For resident
 - For informal caregivers
 - For formal caregivers
- Phase 3 Concept Mapping Exercise
- User Manuals

For phase 4

- D3.3 Study Protocol
- Phase 4 Detailed Procedures
- Phase 4 Interview Guides
- D5.3 VictoryaHome Installation & Customization Guides
- D5.3 VictoryaHome User Manuals

For phase 5

Phase 5 has not yet started.