SHAPES

Smart and **H**ealthy **A**geing
through **P**eople **E**ngaging in supportive **S**ystems

D6.2 – Smart Living Environment for Healthy Ageing at Home Pilot Activities Report

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Revision History

Table 1 Revision History

Revision #	Date	Editor	Comments
0.1	28.09.2020	Sonja Grigoleit (FhG)	ToC
0.2	11.04.2022	Stephanie Ehrentraut (CCS), Stella Baur (CCS)	Incorporation of all use case information,
0.3	28.04.2022	Sonja Grigoleit and Björn Hoog (FhG),	Peer review
0.4	06.05.2022	Stephanie Ehrentraut (CCS), Stella Baur (CCS)	Implementing the comments from the peer review, formatting and final edit of interim deliverable
0.5	30.05.2023	Stephanie Ehrentraut (CCS)	Create template for replicating contributors
0.6	07.06.2023	Ulrike Sobczak (CCS), Stella Baur (CCS), Stephanie Ehrentraut (CCS)	Add the information about phase 4 and 5 from UC001/UC002/UC003
0.7	12.06.2023	Ulrike Sobczak (CCS), Stella Baur (CCS), Stephanie Ehrentraut (CCS)	Include all contributions from replicating sites and tec partner
0.8	19.06.2023	Sonja Grigoleit and Björn Hoog (FhG), Dewar Finlay (UU)	Peer review
0.9	23.06.2023	Ulrike Sobczak (CCS), Stella Baur (CCS), Stephanie Ehrentraut (CCS)	Implementing the comments from the peer review
1.0	26.06.2023	Ulrike Sobczak (CCS), Stella Baur (CCS), Stephanie Ehrentraut (CCS)	Submission of the deliverable

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Table of Acronyms and Abbreviations

Table 3 Acronyms and Abbreviations

Acronym	Full Term
AI	Artificial intelligence
AIAS	Associazione Italiana Per L Assistenza Agli Spastici Provincia di Bologna
API	Application Programming Interface
App	Mobile Application
Avg	Average
BLE	Bluetooth low energy
BMQ	Beliefs about Medicines
bpm	Beats per minute
CAT	COPD Assessment test
CCS	Carus Consilium Sachsen GmbH
CE-IB	Comitè d'Ètica de la Investigació de les Illes Balears
CH	Clinica Humana
CSF	Critical success factor
DOB	Date of birth
DPIA	Data protection impact assessment
EDGE	EDGENEERING
EIP	European Innovation Partnership
EQ-5D-5L	European Quality of Life 5 Dimensions 5 Level Version
EU	European Union
FhG	Fraunhofer Gesellschaft
FICS	Function-Interactions-Content-Style
GDPR	General Data Protection Regulation
GSES	General self-efficacy scale
GUI	Graphical user interface
H&C	Health and care
HCP	Health care professional
ISO	International Standards Organisation
IT	Information technology
KPI	Key performance indicator
MAFEIP	Monitoring and Assessment Framework of the EIP
MAST	Model for Assessment of Telemedicine
MedSyn	Medical Syn

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NASSS-CAT	Non-adoption, Abandonment, Scale-up, Spread, and Sustainability
OMN	Omnitor AB
OSSS-3	Oslo Social Support Scale
PACT	People activities context technology
PMB	Programme Management Board
PO	Primary objective
PT	Pilot theme
RAM	Random access memory
SAL	Residencia de Mayores el Salvador
SDK	Software development kit
SHAPES	Smart and Healthy Ageing through People Engaging in supportive Systems
SO	Secondary objective
SUS	System usability scale
TAM	Technology assessment model
TO	Tertiary objective
TREE	Tree Technology SA
UAVR	Universidade de Aveiro
UC	Use case
UCLM	Universidad de Castilla – La Mancha
UC-PT	Use Case of Pilot theme
UEQ-S	User experience questionnaire - short
UI	User interface
UN	United Nations
UU	University of Ulster
US	United States
UX	User experience
VICOM	Vicomtech
WHO-QOL BREF	World Health Organisation – Quality of Life Questionnaire BREF
WHO-QOL OLD	World Health Organisation – Quality of Life Questionnaire OLD
WP	Work package

Keywords

Pilot campaign, healthy ageing, smart home, digital solutions, wellbeing, remote monitoring.

Disclaimer

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Executive Summary

This deliverable contains the work completed by Pilot Theme 1 of the SHAPES Pan-European Pilot Campaign. It details the planning and outcomes of all activities and tasks that have been completed in Phases 1 to 5 of the pilot campaign.

The work described here is the result of the collaboration and dedication of the whole of Pilot Theme 1, including the pilot and replicating sites / use case leaders, technical leader and partners from the use cases, as well as significant contribution and assistance from other work packages within the SHAPES consortium.

This report contains the following information:

1. An introduction and description of the rationale and purpose of Pilot Theme 1.
2. Detailed description of the work undertaken in Phases 1 to 5 by the four use-cases being evaluated in this pilot theme.
3. An ethical requirements check.

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1 Introduction

Pilot theme 1 is a demonstration for providing an environment for older individuals that contributes to a more independent, better and healthier living at home as well as keeping them integrated into an active and social life. The target group consists of older people (+65 years) living independently and displaying signs of reduced physical and/or cognitive capabilities and/or functions (physical and/or cognitive), but willing to maintain autonomy, independence and healthy living at home. It consists further of communities involved in activities for older individuals, care service providers and informal caregivers.

We aim for an improved wellbeing and independent living for older individuals, improved inclusiveness and social interactions between older individuals, care providers and their communities as well as an improved awareness of municipalities and care providers on the status of older individuals.

To achieve this aim, we have demonstrated and assess the impact of using smart person-aware environments involving smart home solutions and wearable devices (e.g., smartwatches) adapted for older individuals and their specific needs in terms of technology, usability and care processes. We also aim to establish tools to validate safety risk elements in the home environment and to propose how to make a friendly home environment to support age-friendliness.

A smart home provides a comfortable living environment for its users that is also aware of their status (e.g., presence, activity, safety alerts etc.). Where applicable, day-to-day digital assistant or Apps assist the individual to stay connected and aware of relevant events (e.g., medication reminder, medical appointment). Moreover, smart home involves information exchange to provide personalised recommendations about local social events for older individuals, news, notification of public works, garbage collection, local socio-cultural or educational activities, need for volunteers, delivery of support services (house cleaning, hairdressers, walking dogs), transportation, neighbouring networks, educational programmes and cultural events.

Current events show that epidemics play an important role in the lives of older people. Thus, we aim for the involvement of local authorities or businesses to deliver food, medication, walk animals to the elders' homes.

The target group of pilot theme 1 lives in rural areas of Saxony in Germany and are older people living alone. These old people are very reluctant to move somewhere else. They are healthy people and should not be seen as patients. The focus should be on "living" and not on "treating" them. The aim is that they should stay self-reliant. Thus, the technologies should be supportive – they should not take away their freedom to take decisions. The technologies should help them to communicate (easier) with their neighbours, e.g., to have tea together.

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Expected challenges when conducting the pilot:

The technologies used in the smart home context should be easy to understand and as intuitive as possible. Technology also should not be intrusive. It is important to respect the privacy of the older individuals. Therefore, every solution, including cameras, is deemed difficult to use and integrate in the pilot.

Currently, we have no detailed information about the housing of the older individuals. They usually live in 1 or 2 storey houses or in narrow flats. They probably have a phone, but not all of them have WIFI in their home.

Digital connectivity are likely a challenge in these rural areas, both mobile connectivity as well as internet via landline. Other SHAPES partners suggested sat-connection (which is rather expensive) or boxes with SIM-cards. There are several infrastructure projects ongoing in the target region. However, for SHAPES we advise that the best solution is to select participants which have existing internet connectivity at home.

Opportunities of the pilot:

Pilot theme 1 poses exceptional opportunities for the community and the individual responsibility of older people. That is, through the use of challenge solving and generally supporting digital applications, older people are empowered to longer stay at home independently. **Independent living** positively influences **mobility, social activities, self-actualization** and ultimately **healthier and longer living**.

As a result, the empowerment of older people and their increased wellbeing will lead to **less burdening of their families, their social environment and the health system.**

The following use cases are tested in a lead function:

UC-PT1-001: Remote In Home Wellbeing Monitoring and Assessment (UC-Leader CCS; replicating site: AIAS, CH, UCLM/SAL, UAVR.)

UC-PT1-002: Digital Assistant to Support Older People to Live Independently and Remain Socially Connected (UC-Leader CCS; replicating site: AIAS, CH, UCLM/SAL)

UC-PT1-003: Overcoming the fear of digital technologies – competent usage of technologies – problem solving in the community (UC-Leader CCS; replicating site: OMN)

UC-PT1-004: Robot to Support Older People to Live Independently and Remain Socially Connected (UC-Leader CH; no replicating site)

Our aim is to reduce fear by increasing competent usage of digital solutions that solve specific problems of the target group.

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1.1 Rationale and purpose of the deliverable

This deliverable describes the work undertaken for Task 6.2: Pilot Theme 1: Smart Living Environment for Healthy Ageing at Home. It describes the activities undertaken during each of the five phases of the pilot, which closely follow the methodology outlined in Deliverable 6.1.

Pilot theme 1 is being led by Carus Consilium Sachsen GmbH (CCS).

1.1.1 Deliverable Objectives

The high-level objectives of this Deliverable are:

- Introduce the four use cases in pilot theme 1 and describe all work completed on the pilot theme to date.
- Describe the methodology used to conduct Phases 1–3 at each of the pilot sites involved in PT1.
- Report on the key findings at each phase and discuss any implications or considerations required to successfully complete Phases 4 and 5.

1.1.2 Key inputs and outputs

As part of SHAPES ecosystem (Figure 1), the pilot activities include five phases:

1) The first phase includes developing and testing a realistic scenario as a future base for the further planning of the pilot activities.
2) The second phase includes the validation of mock-ups or even prototypes to be able to integrate this user feedback at an early stage of the technological adaptation process.
3) In the third phase, the users can try and test the SHAPES digital solutions of the respective use case to both accustom the user to the technical tool and get further feedback regarding the functional elements of SHAPES.
4) The fourth phase aims to test the SHAPES methods and solutions for later use in a large-scale demonstration. This small-scale demonstration was performed with a smaller group of participants and/or with fewer SHAPES digital solutions to identify factors that could hinder the pilot site from organising and performing a successful large-scale demonstration.
5) The fifth phase is the large-scale demonstration of the SHAPES solution. In this phase, the digital solutions, methods and processes were tested under real-life conditions with the targeted users in the 15 European reference sites.

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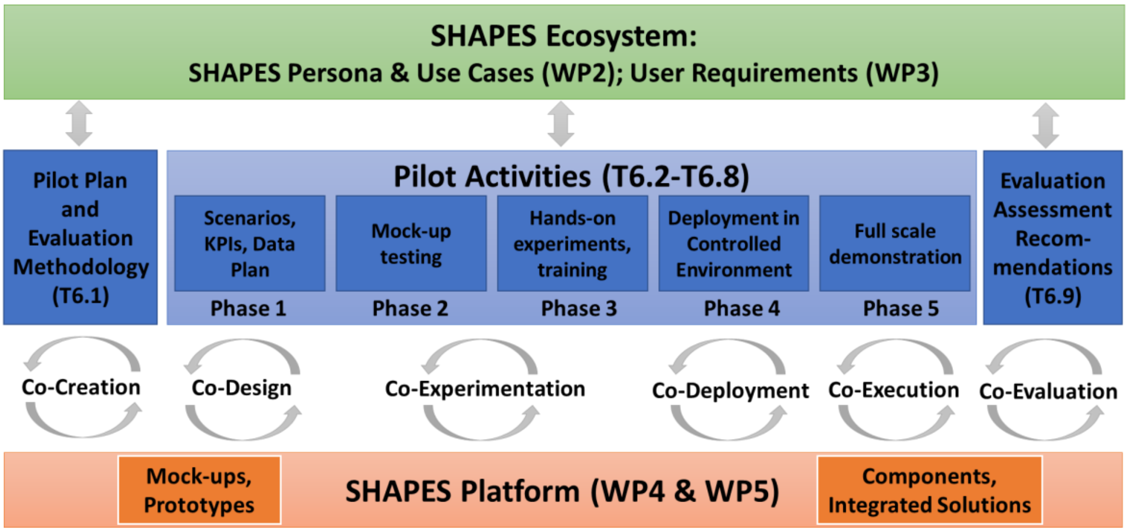

Figure 1: Overview of WP 6.

This deliverable builds on the general evaluation methodology developed in Task 6.1 and is intended to support the overall evaluation of SHAPES in Task 6.9.

In this task, the digital solutions of WP5 and the overall platform to be developed in WP4 are co-designed, tested and co-executed. The outcome of the co-evaluation process is presented in Task 6.9.

The design of the pilots further builds on the persona and use cases, which are developed in WP2, as well as on the user requirements, which are presented in D3.7 – D3.9.

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1.2 Structure of the document

The structure of the document is based on both the implementation and timeline of the pilot. Phase 1-5 are described for each of the four UCs. At the end of the document, the results, conclusions and recommendations from all four UCs are summarised in the Conclusion.

A consent form for the use of the photographs was obtained and signed by the participants.

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2 Use case 001

2.1 Introduction

This chapter describes the pilot activities of UC-PT1-001 Remote in-home wellbeing monitoring and assessment. Target persons of this use case are aged 65 and older, living independently or with sporadic supervision in rural or urban areas of Saxony, Germany. The SHAPES Persona for this pilot theme is 'Ernst':

Ernst is 75 years old, a recently retired former teacher from a college. He lives with his wife Alberta in a small town in Bavaria in their family home with a garden. Ernst is in very good health, he exercises every day for 30 minutes in the morning. His digital literacy and affinity to technology is high. He wants to stay in good health, keep his hobbies and have regular contact with his grandchildren. Furthermore, he sometimes is worried about Alberta, who suffered a stroke 5 years ago. She recovered very well but has to attend regular doctor appointments. Ernst thinks he could perhaps benefit from better information about the after-stroke complications and recommended prevention to better support his wife.

Objectives

Within this use case, a set of digital technologies are to be developed. The main objectives of this use case are to investigate user engagement with the SHAPES App and Digital Solutions and to validate the capability of the SHAPES platform.

Carus Consilium Sachsen GmbH (CCS) is the use case leader. Replicating sites are Associazione Italiana Per L Assistenza Agli Spastici Provincia di Bologna (AIAS), Universidad de Castilla – La Mancha (UCLM) / Residencia de Mayores el Salvador (SAL), Clinica Humana (CH) and Universidade de Aveiro (UAVR).

2.2 Description

This use case addresses older people living independently in rural or urban environments. They usually live alone or with their spouse and are visited or supervised by a family member or caregiver on a regular basis.

In order to foster the early identification of risky situations at home and to detect signs of early physical or cognitive decline, tools that unobtrusively monitor the users are needed. These tools must monitor the user's lifestyle and the accomplishment of Daily Living Activities (DLA). Based on this data, normality patterns are inferred. Once anomalies or risky situations are detected, an alarm is triggered to the corresponding caregiver or relative so that appropriate intervention is carried out.

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2.3 Digital solutions used in this use case

eCare (EDGE)

Remote monitoring platform which collects and displays wellbeing and health data gathered manually or automatically (using connected devices, like the smart watch and smart plug) in a home environment. The platform includes a smartphone App for the target user and a control panel for the health-care professional.

Researcher dashboard (EDGE)

Browser-based dashboard to monitor participant adherence to intervention during the pilot period.

Smart Plug / NOTiFY System (Omnitor)

The system enables the monitoring of home appliances and electrical devices (such as TV, oven, microwave, home presence detectors …) that do not have built-in interoperability capabilities. The system is simple to use, low cost and sends messages to SHAPES TP once the device is turned on or off by the user. NOTiFY Smart plug offers energy monitoring capability. The information can be sent to other systems.

Weather information / FINoT Platform (FINT)

FINoT platform is a FIWARE-based IoT cloud management platform which provide smart neighbourhood and city capabilities like data acquisition and handling for weather, air quality and pollution.

Gateway

The SHAPES Gateway collects the information at home and delivers it to the SHAPES Cloud.

Survey App for wellbeing assessment (Medical Syn)

The appliance was used for recurring questionnaires to assess the wellbeing based on internationally recognized questionnaires (two weeks-questionnaire WHOQOL-OLD) about wellbeing and a daily questionnaire “How do you feel?” designed like a likert-scale.

Wellbeing analysis dashboard (TREE)

DLA patterns are inferred, anomalies are detected, and the corresponding alerts are triggered.

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Due to technical difficulties, this module could not be tested within the phases. A theoretical approach with a demo version of this module can be found in the Annex 1.

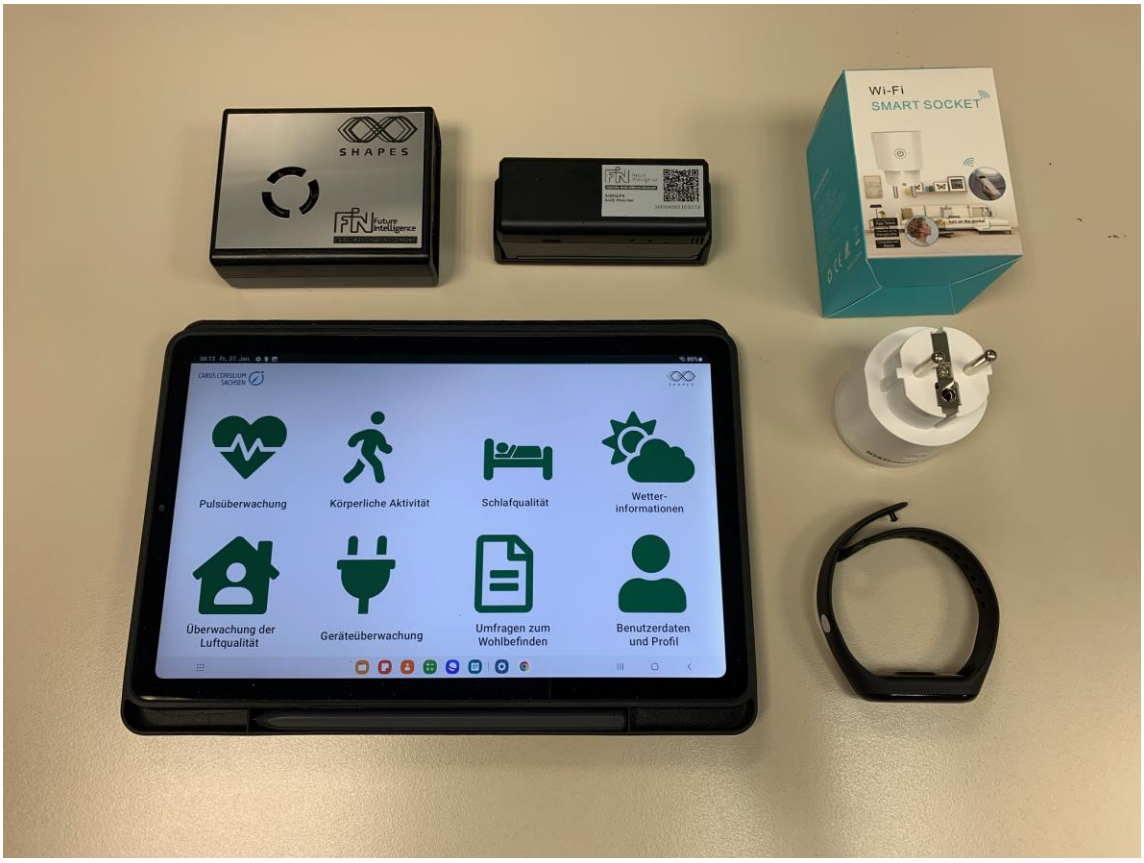

Figure 2: UC-PT1-001 devices

Figure 2 shows the individual technical hardware components of UC-PT1-001.

2.3.1 Digital solutions used for COVID-19 response

The use case itself provides support in the daily lives of older people and remain them socially connected. This is an advantage in the event of a pandemic.

Special COVID-19 digital solutions are not included.

2.3.2 Equipment and devices used (from third parties)

The following additional hardware and software external devices were used in UC-PT1-001:

- Android Tablet (Samsung Galaxy S6 Lite)
- Xiaomi Mi Band 3 (fitness tracker)

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2.4 Data plan

The Data Plan for UC001 has evolved and adapted throughout the pilot period over phases 1 to 5. The detailed data plan can be found in the Annex 2. Table 4 shows an excerpt.

Table 4: UC-PT1-001 Data plan

Outcome
General data (i.e. data related with all pilot goals/covariates)
Caregiver data
Caregiver age
Caregiver highest educational degree
Caregiver spatial distance to care receiver
Internet-related variables with regard to care receiver
Access to device with internet connection at least twice a week (inclusion criteria; Yes/No)
Skilled to use internet (inclusion criteria assessed by referral of participants; Yes/No)
Frequency of internet use
Caregiving-related data
Type of care provided (Formal vs. informal)
Duration of care provision (in years)
Frequency of care provision (number of hours per week)
Existence of other care providers (Yes/No)
Relationship with the care receiver
Cohabitation with the care receiver (Yes/No)
Care receiver data
Care receiver age
Care receiver gender
Degree of dependence (subjectively evaluated by the informal caregiver)
Individual top three challenges
Use Case 1 (Wellbeing Assessment)
Wellbeing scores (WHOQOL-OLD, daily survey)
Status of home appliances (on/off)
Time / duration of home appliance status
Physical activity data (daily steps)

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Sleep data (duration, begin / end, wake ups at night, time per sleep stage)
air quality (temperature, humidity, PM, CO2)

2.4.1 Data capture methods to be used

A range of different data capture methods were used during the five phases of this pilot. More details can be found under the sections describing Phases 1 to 5.

2.4.2 Planning of evaluation

The Model for Assessment of Telemedicine (MAST) framework was used to evaluate the effectiveness and contribution of UC-PT1-001 to quality of care. MAST is described as a multidisciplinary process that summarises and evaluates information about the medical, social, economic and ethical issues related to telemedicine.

A review of the seven dimensions of MAST revealed that three of the seven multidisciplinary dimensions/domains were of specific relevance to the pilot of UC-PT1-001. These were Clinical Effectiveness, Patient Perspectives and Economic Aspects. Table 5 contains the data required for the MAST evaluation.

Table 5: UC-PT1-001 Data required for MAST evaluation

MAST Domain	Topic	Outcome	Data required	Time point
Clinical Effectiveness	Mental health	OSSS-3 (social support) and life events		
	Effects on health-related quality of life	Health related quality of life and wellbeing	EQ-5D-5L-VAS; WHOQOL-BREF scores	Baseline, end of pilot
Patient perspectives	Satisfaction and acceptance	User acceptance	TAM scores	End of pilot
	Understanding of information Confidence (in the treatment)	Usability of application	SUS scores 1-item health literacy	End of pilot

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	Ability to use the application Access & Accessibility			
	Empowerment Self-efficacy	User engagement	Number video calls	End of pilot
		Self-efficacy	SHAPES Participation questionnaire	During pilot
			GSES (Self-efficacy)	Baseline, end of pilot
Economic aspects	Amount of resources used when delivering the application and comparators	Cost of devices	Cost as per device purchasing invoice	End of pilot
		Cost of using digital solutions and SHAPES Platform	Costs to be provided by SHAPES	End of pilot
		Cost of staffing	Timesheets and costing data	End of pilot

MAFEIP

Due to the small size of the pilot, the data needed to be input into the Monitoring and Assessment Framework for the European Innovation Partnership on Active and Healthy Ageing (MAFEIP) tool are likely to be biased and, therefore, the MAFEIP was not used to evaluate UC-PT1-001.

2.4.2.1 Final check of the use case by using the CSFs of MOMENTUM and the NASSS framework

MOMENTUM

The MOMENTUM blueprint was applied to check if UC-PT1-001 had the critical success factors (CSFs) needed to take it from the pilot phase to large-scale

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deployment. Details of each CSF are provided below. Further information can be found in Annex 3.

CSF 1. Cultural readiness for the telemedicine service

According to interviews in mock-ups, participants of PT1 are willing to share activity and behavioural data with them. Patients usually accept new technologies as far as they have a clear benefit.

The participants already use digital solutions in their daily life and often show a medium to high digital literacy. Even participants with less digital knowledge are aware of the potential benefits that digital solutions can offer.

CSF 2. Advantages of telemedicine in meeting compelling need(s)

In order to foster the early identification of risky situations at home and to detect signs of early physical decline, tools that unobtrusively monitor the users are needed. These tools (like the smart watch or the smart plug) must monitor the users' lifestyle and the accomplishment of Daily Living Activities.

With the help of SHAPES digital solutions, a set of recommendations are made, and normality patterns are inferred. Once anomalies or risky situations are detected, an alarm is triggered to the corresponding caregiver so that appropriate intervention is carried out.

CSF 3. Ensure leadership through a champion.

CCS is a regionally well-known actor and promotes the use case and the technology.

CSF 4. Involvement of health care professionals and decision-makers

The deployment of this use case did not foresee any participation of health care professionals and thus they have not been involved in the development.

CSF 5. Put the patient at the centre of the service

The participants have been involved in mock-up presentations in phase 2 and hands-on training in phase 3.

The objectives of the use case are to promote social activity and active healthy ageing. Studies show that seniors who stay socially active and engaged experience a variety of benefits, both in physical and psychological health.

Due to the cooperation with the participants and getting their feedback, it is possible to further develop the digital solutions and adjust them to the individual needs of the older people.

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CSF 6. Ensure that the technology is user-friendly

It is the objective, and great effort is made within the SHAPES consortium to define requirements to present the technologies of UC001 as user friendly as possible to older persons. The visual design, but also the operation of the digital solutions are adapted to the needs of the older people. The handling should be as intuitive as possible. Half-day training is expected to be sufficient.

CSF 7. Pull together the resources needed for deployment

The resources required for deployment of the digital solutions for the pilot are available thanks to SHAPES funding and internal resources already allocated. The technical partners of the use case provide all IT competences.

CSF 8. Address the needs of the primary client(s)

Older people/families are potential clients. The solution is used as a tool (for caregivers) to promote social activity and as a system that detects risky situations. It can enhance the security feeling of the care-receiver, as well as for the caregiver.

Healthcare providers are potential customers. The ability to care for individual seniors may allow for more individualized therapy and faster therapy changes once a decrease in any physical concern is detected.

CSF 9. Prepare and implement a business plan

A business plan for the solution is developed in D7.3 SHAPES Business Plan WP7.

CSF 10. Prepare and implement a change management plan

It will be evaluated after the end of the project.

CSF 11. Assess the conditions under which the service is legal

Completing a Data Protection Impact Assessment (DPIA) identified and minimized any risks associated with the pilot with input sought from other WP and the SHAPES Data Protection Officer at CCS. Data processing agreements were established with relevant partners to permit access to pseudonymized data.

CSF 12. Guarantee that the technology has the potential for scale-up

Although the participants in the pilot are limited, the solution is being designed to scale it to a pan-European level. eCare has the potential for scale-up as it is a well and often tested and user-friendly technology that runs on the web and uses a commercial and well-disseminated input device.

CSF 13. Identify and apply relevant legal and security guidelines

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GDPR has been applied. The system provided implements with all security and privacy-related regulations.

CSF 14. Involve legal and security experts

We are working with SHAPES partners for example with LAUREA, with extensive expertise in this field. VICOM was awarded the ISO 27001 certification for information security management. HMU and VICOM have extensive expertise in IT infrastructure security.

CSF 15. Ensure that telemedicine doers and users are privacy-aware

The CCS employees already work with data protection protocols. They were also instructed on the application of data protection with the new technologies introduced in the pilot. Older people and informal caregivers were informed about data collection and process and consent was collected.

CSF 16. Ensure that the information technology infrastructure and eHealth infrastructure are available

We understand that the IT infrastructure for the deployment of the technology is being provided through the SHAPES platform. An appropriate infrastructure for the deployment of the digital solutions within the organisation has been in place for the pilot.

CSF 17. Put in place the technology and processes needed to monitor the service

A system to monitor the pilot has been set up with support from WP4 and WP5 partners. Local IT and community support are also available to help address minor issues with the use of digital solutions. Depending on local COVID-19 social distancing measures, support may need to be provided remotely. A system to monitor and mitigate incidences was established. It is impossible to predict any incident that may occur in a research project. It is more appropriate to assess the relative risks of certain incidences and have an appropriate plan in place for mitigating and managing incidents. The local research project team and community support officers were available to support participants in resolving any doubts they might experience with the digital solutions.

CSF 18. Establish and maintain good procurement processes

Standard local procedures which comply with all of the required regulations were followed for the procurement of devices. Service level and maintenance agreements were in place as per contract if required.

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NASSS

The NASSS framework was used to detect areas of complexity in the project plan for piloting UC001 and, if needed, to make adaptations to the plan. The short versions of NASSS-CAT questionnaire was considered and completed by the pilot team (see Annex 4). At the time the NASSS framework was applied, of the seven domains, there were three domains ('Technology', 'Intended adopters' and 'value proposition') in which significant complexities were identified that, if not mitigated or addressed, were likely to affect the project's success at the piloting stage of the use case. (Table 6)

Complexities were identified in other domains, however these were related to a larger scale implementation and deployment of the use case into practice and so were not considered to be relevant at this stage of the project. They provide a useful basis for further exploratory research.

Table 6: UC-PT1-001 Complexities and mitigation measures identified using the NASSS framework

NASSS complexity domain	Uncertainties detected	Mitigation measures taken
Technology	The data-transfer involving e-Care is not fully working yet	Meetings with EDGE are being conducted to define the data-transfer requirements and finding solutions.
Technology	The exact role and functionality of the platforms had not yet been defined/communicated to the use case leaders	Cross WP alignment meetings are set up between WP leads and pilot leaders to discuss data flow and functionality of the SHAPES platform
Technology	Many interdependencies were developed. Bugs and crashes are expected.	Constant check and support the technological partner is needed to keep developing times.
Intended adopters	Level of digital literacy in the intended participant population. As a minimum requirement service, users need Wi-Fi already installed in their home	User experience evaluation with the aim to capture how well the technology is accepted by participants.
Value proposition	Positive effects are difficult to measure.	User experience evaluation with the aim to capture how

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	There is no opportunity to follow the interaction of the user with the digital assistant. The caregiver only receives alerts if anomalies / no reaction from the older persons is detected.	well the technology is accepted by participants and caregivers

2.5 Phase 1

2.5.1 PACT and FICS Scenario

Table 7: UC-PT1-001 PACT Scenario

Code	UC-PT1-001 Version 0.2 Date 2022/01/04
Applicable SHAPES Persona	Ernst (P1), Roberto (P2), Ayesha (P3), Isabelle and Marco (P4, especially needs of care giver), Helena (P7)
Applicable SHAPES use case	UC-PT1-001 Remote In-Home Wellbeing Monitoring and Assessment
Point of contact (pilot site)	Carus Consilium Sachsen GmbH
Point of contact (technical provider)	EDGENEERING (EDGE)
People **Roles and/or actors of typical users involved in delivering and receiving the telemedicine intervention**	• Older people, 65+ years, care recipient, living independently in their own home in rural or urban environments. They usually live alone or with their spouse and are visited or supervised by a family member or caregiver on a regular basis. They have non to average level e-literacy and in some cases access to smart phone, laptop or PC. • Care giver: most likely relative(s), have an average to high level of -literacy and access to a smart phone, laptop or PC.
Activities **Activities to be performed by the actors in order to successfully provide and receive the telemedicine intervention** **procedures for the professional and the patient; Parameters that determine the**	**Older people / care receiver** • Status of home appliances • Air quality measurement by using a sensor • analysis of activities (e.g. steps) by wearing a smart watch • analysis of sleep by wearing a smart watch • data was used to analyse patterns of home appliances used, physical activity and sleep and resulting recommendations • Answer wellbeing survey based on internationally recognized questionnaires and daily Likert Scala for direct wellbeing assessment in addition to sensor data **Caregiver**

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measures used in the intervention	• React to triggered alarms that show abnormalities from normality patterns • Review analysed data and given recommendations
Context **Social-medical relevance of the telemedicine intervention; privacy issues; risks for the patient; locations**	• Sensors were installed in older people´s own home to monitor daily living activities • The older people wear a smart watch to monitor activities and sleep data. • The older people furthermore get a tablet to answer the questionnaire and daily survey and to get a look at their daily recorded data. • The daily data recorded can be reviewed by care givers. • One of the key goals is to enable the independence of older people. • Identification of risky situations at home • Detect signs of early physical or cognitive decline using unobtrusively monitoring sensors. • Maintaining privacy of data is of the utmost importance. An identification list (including name and date of birth) was held at the local pilot site. • GDPR and ethics in line with WP8 • Data and servers must be located within the EU • German language • Location: Saxony, Germany
Scenario:	<u>Older person:</u> Ernst is 75 years old, a recently retired former teacher from a college. He lives with his wife Alberta in a small town in their family home with a garden. Ernst loves to sing in the church choir and regularly does volunteer work for the local church charity. He and Alberta go once weekly to an older adults dancing club. They also love travelling – every year they go on a foreign holiday. Ernst is in very good health. He exercises every day for 30 minutes in the morning. He likes to try new types of exercises according to his actual problems (usually slight knee pain or back pain) and often takes long walks. Ernst sometimes worries about Alberta, who suffered a stroke 5 years ago and although she recovered very well, she has to go to regular medical check-ups every 6 months, and he is always worried about the results. Together they enjoy doing the cognitive training exercises from the bool Alberta got from her doctor.

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	Ernst usually wakes up at 7.00 am in the morning. He first goes to the bathroom and then prepares breakfast for himself and his wife. During breakfast, he has his tablet at hand and checks his sleep behaviour of the previous night. For some time now, he has been wearing a smart watch for his own interest as well as to monitor his own data and health status. It records activity, sleep and heart rate. His two sons, who live with their families in a big city 50 kilometres away, can also see this data for security reasons. This gives Ernst a good feeling, as he knows that his sons will automatically receive information, or an alert should the data be unusual. This morning his sleep evaluation looks good. He went to bed at 22:00 and took 30 minutes to fall asleep. He had a quiet sleep with a long deep sleep phase. He woke up 6:30 am and got up 07:00 am. That's a total of 8 hours of sleep, which is very good and in line with the sleep goal. Ernst also records his subjective perception of his well-being by answering questions regarding his well-being in the SHAPES app, usually during his breakfast. This morning he cannot give full marks because he has slight knee pain. This is nothing unusual, as it is usually the case after getting up and usually improves during the day with exercise. After breakfast, Ernst goes into the garden and does some necessary work. He also wears his smart watch, which registers the steps he takes. Around 11:00 a.m., Ernst goes for a short walk because he knows from the smart watch that he still has a few steps to go to reach the ideal value. He knows that this is good for his health, so it is not a burden for him. His wife Alberta accompanies him. After they return home, Alberta prepares lunch. Ernst briefly checks the steps he has already taken on his watch and is pleased that he will probably reach the required number of steps by taking part in the afternoon dance class. Afterwards, they both have lunch. After lunch, Ernst's tablet issues a message to air the kitchen. Ernst has installed an air quality sensor in selected rooms via the SHAPES app. This sends a message as soon as certain reference values are exceeded or not reached. Ernst then ventilates the kitchen.

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	Both seniors rest and take a short nap. In the afternoon, both have their once-a-week appointment at the senior dance club in the neighbouring small town. Both are really looking forward to it. Ernst goes by car. They both love dancing. Back at home, Ernst is again told that it is time to air the room. In the evening, Ernst is satisfied that he has once again successfully achieved the step goal, and the couple makes plans for the coming day. Ernst has singing practice with the church choir, and Alberta has her regular medical check-up appointment. Ernst quickly answers the questions about his well-being. This evening, in contrast to the morning's answers, he can give full marks. Ernst is no longer in pain and feels very well. Both seniors have dinner together and then enjoy a quiet evening watching television. Just before going to bed, Ernst is alerted by a short signal tone from the tablet that the TV is still on in the living room. The television is monitored by a sensor on the device. Ernst then turns the TV off before he goes to bed. <u>Caregiver/relatives:</u> Both of Ernst's sons use the SHAPES App and have a so-called caregiver access. With this, they can also view their father's data, receive the recommendations given to the senior during the day and receive an alert in case of emergency if an unusual situation occurs. Like every morning, both sons check their father's data on their mobile phones. This night he seems to have slept well. They can see this from the sleep data, which is recorded by their father's smart watch and can also be viewed by them via the Caregiver access to the SHAPES App. Since they have been using this App together with their father, both sons feel better and are a little more reassured because they know how their father is doing at almost any time. This not only gives them a good feeling of security but also their father, Ernst. For example, two weeks ago the

	incident occurred that their parents forgot to turn off the iron. Both sons received an alert on their mobile phones and were able to react accordingly. The parents were in the garden at the time and were able to act quickly and switch off the iron before anything worse happened. Both sons are used to that their father often does not give full marks early in the morning when questioned about their well-being, as he usually has slight knee or back pain which becomes less as the day progresses. This was apparently the case today as their father actually entered the maximum score in the evening. During the day, both sons could see that their father is very active. They are both very happy that their parents are still so independent and active in life.

Technology
 	
Type of information / parameter that are relevant in monitoring the health status; type and frequency of accessibility of information; feedback modalities (communication*)*
	Older people / care receiver
	• Age (year not Date of Birth)
	• Gender (m/f/d)
	• Degree of dependence
	• Individual top three daily / common challenges
	• Internet-related variables
	    ○ Access to device with internet connection at least twice a week (inclusion criteria; Yes/No)
	    ○ Skilled to use internet (inclusion criteria assessed by referral of participants; Yes/No)
	    ○ Frequency of internet use
	
	Care giver
	• Age
	• Highest educational degree
	• Spatial distance to care receiver
	
	Caregiving-related data
	• Type of care provided (Formal vs. informal)
	• Duration of care provision (in years)
	• Frequency of care provision (number of hours per week)
	• Existence of other care providers (Yes/No)
	• Relationship with the care receiver
	• Cohabitation with the care receiver (Yes/No)
	
	Wellbeing Assessment
	• 2 weeks Wellbeing assessment score (based on questionnaire WHO-QOL OLD)

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	• Daily Likert scale of individual wellbeing status • Status of home appliances (on/off) • Time / duration of home appliance status • Air quality • Physical activity data (daily steps, time of exercise, daytime sleep) • Sleep data (duration, begin / end, wake ups at night, time per sleep stage) • Heart rate In addition, see the data plan.

Table 8: UC-PT1-001 FICS Scenario

Function and events ***Functionality of the intended system, which is capable to realise the actor's activities***	The system will offer to the older persons: • Status of home appliances • Air quality measurement by using a sensor • Analysis of activities (e.g. steps) by wearing a smart watch • Analysis of sleep by wearing a smart watch • Data will be used to analyse patterns of home appliances used, physical activity and sleep and resulting recommendations • Answer wellbeing survey based on internationally recognized questionnaires and daily Likert Scala for direct wellbeing assessment in addition to sensor data In addition, the system will provide for the care giver: • React to triggered alarms that show anomalous situations from normality patterns • Review analysed data and given recommendations
Interactions and usability issues ***User-system or system-component interactions meditating actor's activities; Types of***	In this use case, we expect to have two users: • Older person • Care-giver – most likely relatives There will be two front-ends – one for the older person and one for the care giver, depending on the login. **The older person will have access to the following data:**

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the interactions, e.g. unidirectional data streaming service or reliable messaging service	**User data (one time input) from itself:**
	• Age (year not Date of Birth)
	• Gender (m/f/d)
	• Degree of dependence
	• Individual top three daily / common challenges
	• Internet-related variables
	  ○ Access to device with internet connection at least twice a week (inclusion criteria; Yes/No)
	  ○ Skilled in using the internet (inclusion criteria assessed by referral of participants; Yes/No)
	  ○ Frequency of internet use
	
	User data (regular data collection) from itself:
	• Status of home appliances
	• Air quality measurement by using a sensor
	• Analysis of activities (e.g. steps) by wearing a smart watch
	• Analysis of sleep by wearing a smart watch
	• Data will be used to analyse patterns of home appliances used, physical activity and sleep and resulting recommendations
	• Answer wellbeing survey based on internationally recognizes questionnaires and daily Likert Scala for direct wellbeing assessment in addition to sensor data
	
	<u>The care giver will have access to the following data:</u>
	
	User data (one-time input) from itself:
	• Age
	• Highest educational degree
	• Spatial distance to care receiver
	
	Caregiving-related data between the care receiver and the care giver:
	
	• Type of care provided (Formal vs. informal)
	• Duration of care provision (in years)
	• Frequency of care provision (number of hours per week)
	• Existence of other care providers (Yes/No)
	• Relationship with the care receiver
	• Cohabitation with the care receiver (Yes/No)

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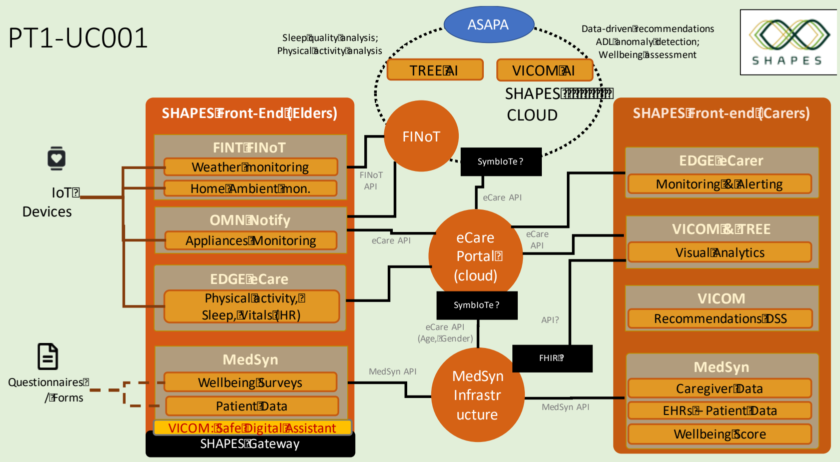
<table>
<tr><td></td><td>Data of the older people assigned to him/her:
React to triggered alarms that show anomalous situations from normality patterns
Review analysed data and given recommendations</td></tr>
<tr><td>Content and structure

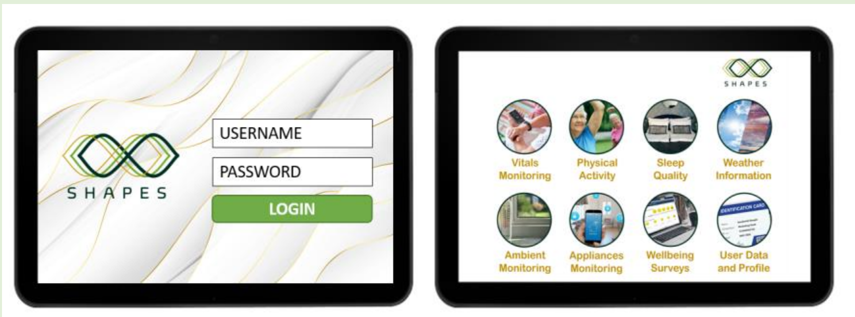
Variables of the interaction</td><td>The older person’s front-end will be on an Android tablet. The interaction will use the touch-screen interface. Data will be sent automatically from the sensors to the tablet.

The caregivers will interface through SHAPES Android App.

The following image represents the content and structure built to support this use case.



The SHAPES Front-end App delivers a single centralised access to the different digital solutions and their provided functionalities:



Each functionality is then provided by the respective digital solution, enabling the user to visualise all the relevant information concerning the specific functionality and to interact with the solutions by making entries, providing feedback and answering two questionnaires.</td></tr>
</table>

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	Overall, the use case will address the following data: • Home appliances status; • Air quality measurements; • Weather information; • Heart rate measurements; • Physical activity measurements; • Sleep activity measurements; • Answers to questionnaires; • Reminders or notifications to specific tasks; • Alerts on anomalous situations; • Recommendations for a healthier lifestyle; Each measurement or data will be timestamped.
Style and aesthetics ***Look and feel of the system***	The technological solution supporting the use case adopted a “look and feel” inspired in the SHAPES project identity, namely its logo, colours and the use of photos. As a result, the digital solutions present the SHAPES logo and the logo of the partner organising the use case pilot; they also use green and golden tones and the national language of the use case pilot participants. Following the SHAPES UX guidelines (Deliverable D5.1), the digital solutions present a simple and straightforward language and a friendly, easy-to-use navigation scheme. The following images exemplify the style and aesthetics of the different digital solutions supporting the use case. 

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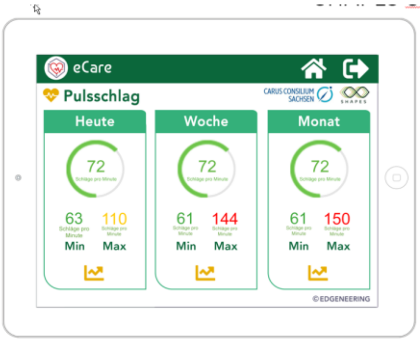

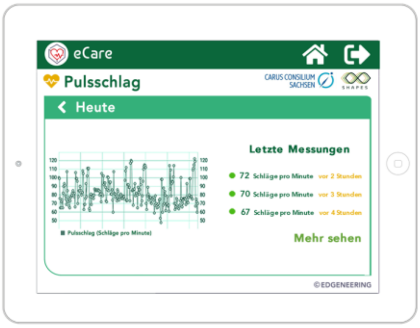

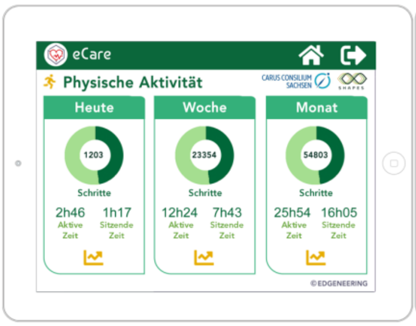

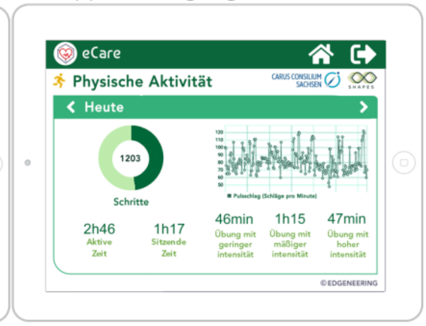

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	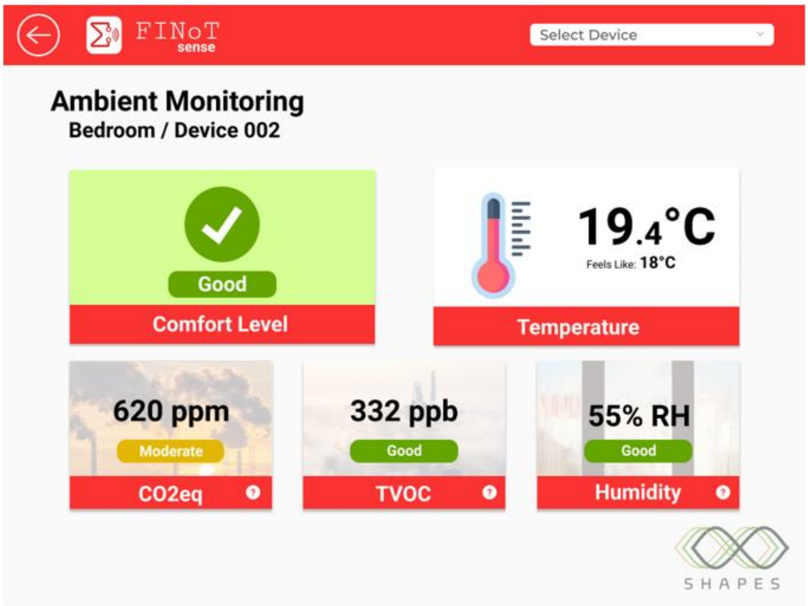 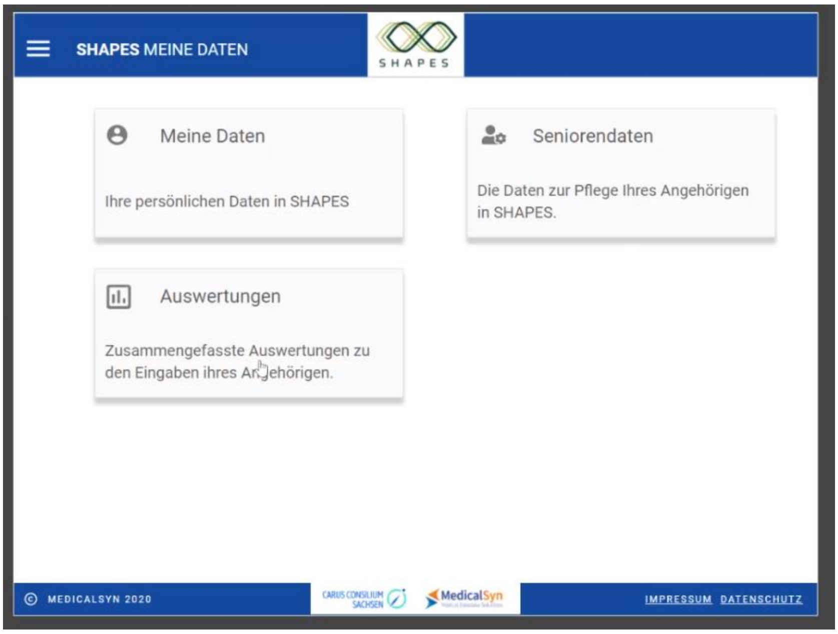

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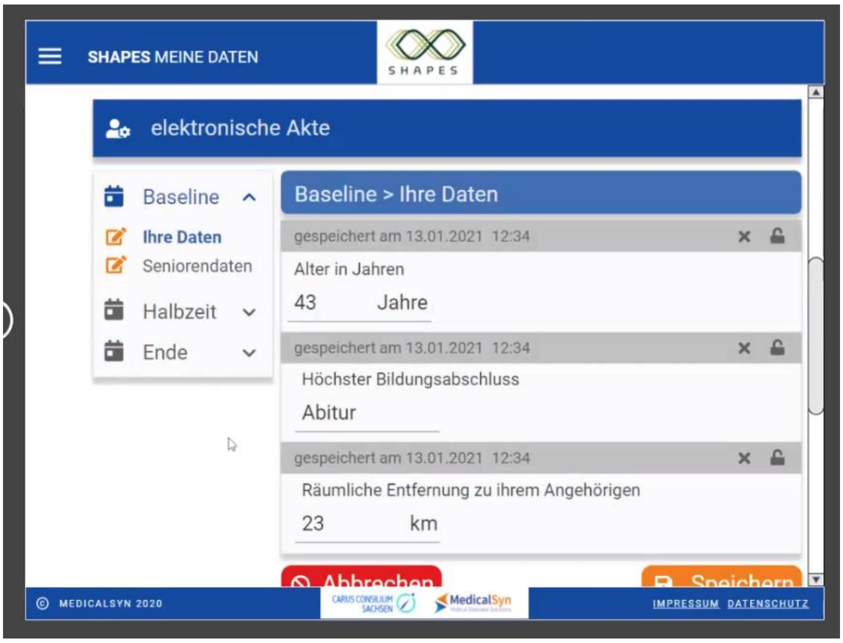

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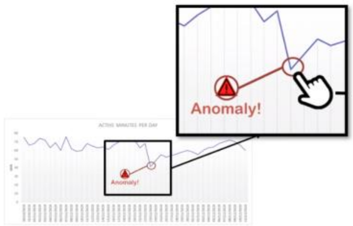
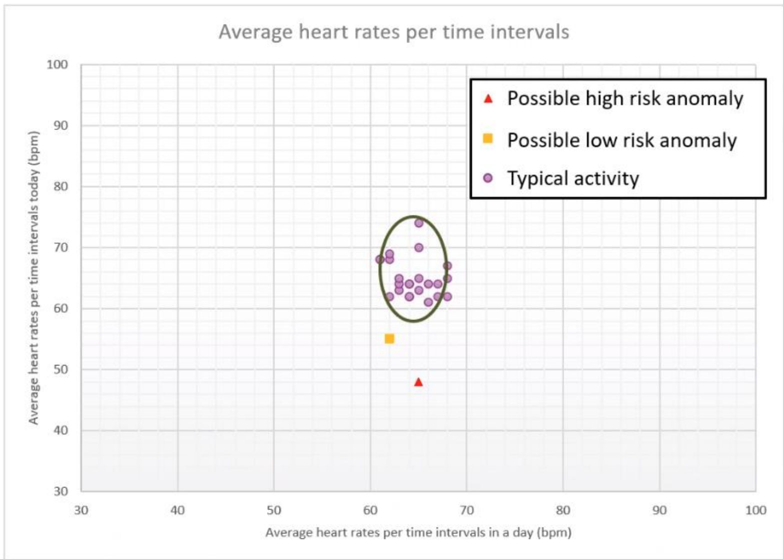
Rest of data around detected anomaly

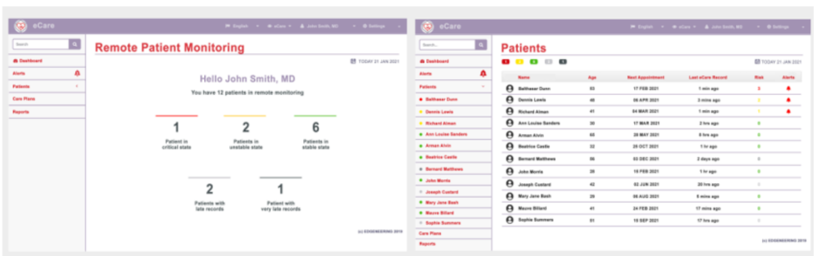
- Give option to examine the rest of attributes of that day.
- Use of colors to emphasis "dangerous" values.



ID: 2369847 Date: 2020/11/15

Sleep Quality Indicator	89%
Sleep time	7,34h
Time in bed	8,2h
Awake interruptions	2
Get out bed interruptions	1
Latency time	7min
Bedtime	2020-11-15 21:56:05
Sleep start	2020-11-15 22:03:05
Get up time	2020-11-15 06:05:24
Number of steps	224
Time sedentary	832min
Time active	3min
Time active in ADL	3min
Time active aerobic activity	0min
Time aerobic low	3min
Time aerobic moderate	0min
Time aerobic vigorous	0min
Average blood pressure	102/65
Average oxygen saturation	95
Average heart rate	52
Max heart rate	69
Min heart rate	48
Average blood glucose	99





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2.5.2 Key performance indicators

Key Performance Indicators (KPIs) are defined as a set of measures that focus on the factors most critical to a project's success. KPIs are measurable and quantifiable with a target or threshold. They measure performance in critical areas by showing the progress or lack of it towards realising the objectives of each specific use case. The following KPIs have been chosen to determine whether or not the pilot for UC-UC-PT1-001 has been successful.

Failure to meet four or more of the KPIs indicates that repetition or major revisions to the use case and associated digital solutions are needed before entering further development oriented to commercialisation.

KPIs

The base of the evaluation is the German school grading system; 1 = very good/excellent, 2 = good, 3 = sufficient, 4 = poor, 5 = insufficient. Grade 3 should always be achieved. (Table 9)

Table 9: UC-PT1-001 KPIs

school grading system / grade 3 should always be achieved = KPI (min.)										
		1 = excellent		2 = good		3 = sufficient		4 = poor		5 = insufficient
UC-PT1-001 KPI for phase 5		complies with		complies with		complies with		complies with		complies with
KPI 1: successful participant recruitment (target 10 participants)	1	10	2	9-8	3	7-6	4	5-4	5	< 4
KPI 2: How many recruited participants remained enrolled in	1	10	2	9-8	3	7-6	4	5-4	5	< 4

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the pilot until the end of phase 5?										
KPI 3: How many % of the offered 14-day questionnaires were fully completed (WHOQOL-OLD)?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 4: How many % of the offered daily questionnaires were answered?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 5: How many % of participants wearing the smartwatch during 60 % of the days?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 6: How many % of participants wearing the smartwatch during 60% of the night?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%

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KPI 7: How many % of all support cases during the test phase are serious cases? What are serious support cases? - System crash, user cannot log in, system does not collect data, support from/with technical Partners necessary, …	1	5%	2	>5%-10%	3	>10%-15 %	4	>15% -20%	5	>20%
KPI 8: SUS Score (System Usability Scale)	1	Best Imaginable (100%)	2	Excellent (>80 %)	3	Good (80-60%)	4	Poor (<60 %)	5	Worst Imaginable (<15%)
KPI 9 How many % of participants are willing to use the digital solutions	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%

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after the test phase?										
KPI 10: In general, how many % of participants feel that it would be useful to develop a specific platform for healthy ageing?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
Summary						At least 70% of the KPIs must be met for the UC to be successful.				

2.5.3 Timeline of pilot activities

The original timeline of pilot activities, according to the Description of Work was to conduct Phase 1, 2 and 3 between May 2020 and July 2021, then Phase 4 (deployment in controlled environment) in September 2021-April 2022 and Phase 5 between May 2022 and March 2023.

Due to the onset of the COVID 19 pandemic and the related changes in the work situation, as well as the severely limited opportunities for contact with senior citizens, the first phases 1-3 in particular were delayed in some places by up to 4 months. Also relevant here are the technological challenges that arose during the development process. Overall, it was possible to reduce the delays of the first phases somewhat by

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streamlining phases 4 and 5, so that it was possible to postpone the completion of the pilot by 2 months from April 2023 to June 2023. (Table 10)

Table 10: UC-PT1-001 Timeline of pilot activities

Task 6.2: Pilot Theme 1: Smart Living Environment for Healthy Ageing at Home			
UC-PT1-001: Remote In-Home Wellbeing Monitoring and Assessment			
Months		***original amendment***	***real timeline***
Nov 19	**1**	start of SHAPES	
Dez 19	**2**		
Jan 20	**3**		
Feb 20	**4**		
Mrz 20	**5**		
Apr 20	**6**		
Mai 20	**7**	phase 1	phase 1
Jun 20	**8**		
Jul 20	**9**		
Aug 20	**10**	phase 2	
Sep 20	**11**		
Okt 20	**12**		
Nov 20	**13**		
Dez 20	**14**		phase 2
Jan 21	**15**		
Feb 21	**16**	phase 3	
Mrz 21	**17**		
Apr 21	**18**		
Mai 21	**19**		
Jun 21	**20**		
Jul 21	**21**	ID	
Aug 21	**22**	phase 4	
Sep 21	**23**		phase 3
Okt 21	**24**		
Nov 21	**25**		
Dez 21	**26**		
Jan 22	**27**		
Feb 22	**28**		
Mrz 22	**29**		
Apr 22	**30**		
Mai 22	**31**	phase 5	ID
Jun 22	**32**		phase 4
Jul 22	**33**		
Aug 22	**34**		
Sep 22	**35**		

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Okt 22	**36**		
Nov 22	**37**		
Dez 22	**38**		
Jan 23	**39**		phase 5
Feb 23	**40**		
Mrz 23	**41**		
Apr 23	**42**	**D**	
Mai 23	**43**		
Jun 23	**44**		**D**
Jul 23	**45**		
Aug 23	**46**		
Sep 23	**47**		
Okt 23	**48**	end of SHAPES	

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2.6 Phase 2: Testing of mock-ups and prototypes

2.6.1 Methodology of testing

Aim

The aim of the mock-ups was to validate the functionalities of technologies in UC-PT1-001 and the way they are planned to be implemented, including the interaction with the users, based on the feedback provided by users. In addition, this pilot also aimed to collect new functionalities. The outcome of this pilot phase provided technical partners with the opportunity to integrate user feedback at an early stage of the technological development process.

Method

The appointments with the 18 seniors were conducted in presence, observing and fulfilling all the required COVID-19 requirements. Six appointments, two hours each, took place. The seniors were divided into small groups of three to four participants. The composition of the groups was determined by the digital literacy of the individual participants. A differentiation was made between "no digital literacy" (no experience at all in dealing with digital technologies), "medium level" (already had experience) and "high level" (already has a lot of knowledge in the area of digitization). In order to create a feel-good atmosphere and an open culture of discussion, participants with similar levels of digital literacy were divided into groups. That ensures that no one was afraid to get involved in the discussion due to their (lack of) knowledge and openly communicate their ideas, suggestions and questions. Furthermore, small breaks were made, coffee and cake were provided and last but not least the participants received a goodie-bag. The Phase 2 mock-up presentations with recruited participants were conducted between 28th June 2021 and 13rd July 2021.

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A PowerPoint presentation was shown, during which participants were presented with brief background information about the SHAPES project and an overview of the purpose and features of the PT1–UC001 digital solutions. Mock-ups, e.g., visual images of all the types of screens a patient is likely to encounter when using the App, were then presented to participants.

Figure 3: UC-PT1-001 Mock-up session

The senior's assessment was captured using two methods. Firstly, a CCS staff member observed the participants' reactions during the presentation and noted down their comments and criticisms for later evaluation. Secondly, the participants were given a questionnaire to complete at home. The questionnaire included the following categories:

- Perception and comprehension – the participant understands the information transmitted, the necessity/advantages of using the digital solution
- Interaction, intuition and function – the participant is able to find the desired information or complete his task without any previous knowledge or experience regarding the presentation or structure of the information offered
- Design and layout – the participant is able to recognize all symbols/icons, understandable/clear design of the digital solution
- General feedback – the participant should evaluate the usefulness of the application and name suggestions for the improvement to make the digital solution more user-friendly
- Experiences – the participant should report on their previous experiences with digital technologies.

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Questions were guided by the standard ISO 14915, which specifies four principles for the design of multimedia applications. The principles are:

- Suitability for the communication objective — the presentation of the information is suitable for achieving the goals of the providers and visitors.
- Suitability for perception and understanding — the information transmitted is easy to understand and can be easily recorded.
- Suitability for exploration — the participant is able to find the desired information or complete his task without any previous knowledge or experience regarding the presentation or structure of the information offered.
- Suitability for user motivation — a participant must be encouraged to act. By focusing on the needs of the participants, an appealing presentation and goal-oriented guidance, the participant can be motivated.

Informed consent procedure

Eligible target users were provided with a participant information sheet (see Annex 5) explaining the background and purpose of the study and what they can expect to happen if they agree to participate. Those who agreed to take part were given a consent form (see Annex 6) and data security information (Annex 7). Signed consent forms and contact details were provided to the pilot leader to proceed with the study activities.

Informed consent for all participants was taken with the following accepted forms of signatures:

- Physical handwritten signature
- An electronic representation of a handwritten signature

The informed consent signed by participants was signed by the SHAPES manager at CCS to acknowledge reception and a physical or electronic copy of the document was provided to the participants by personnel of CCS.

The consent process collected the following personnel:

- Name: in the consent form, for the purpose of identification of the accepted consent.
- Email (optional): if the signed consent form is sent to CCS by email, the same email was used to return a countersigned copy. Afterwards, the email was deleted for all other purposes of this project.
- Address (optional): the participant may provide a physical address to receive the countersigned copy of the consent form. Afterwards, the address details are be deleted for all other purposes of this research study.

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2.6.2 Results of testing

During the mock-up meetings, none of the participants was underwhelmed or overwhelmed. They felt comfortable and were not shy and did not hesitate to express their questions, criticism or ideas. Everyone was very interested in the project and digital solutions. CCS was able to present the first development and design drafts to the participants to illustrate the possible applications of the SHAPES solutions. (see in the figures below)

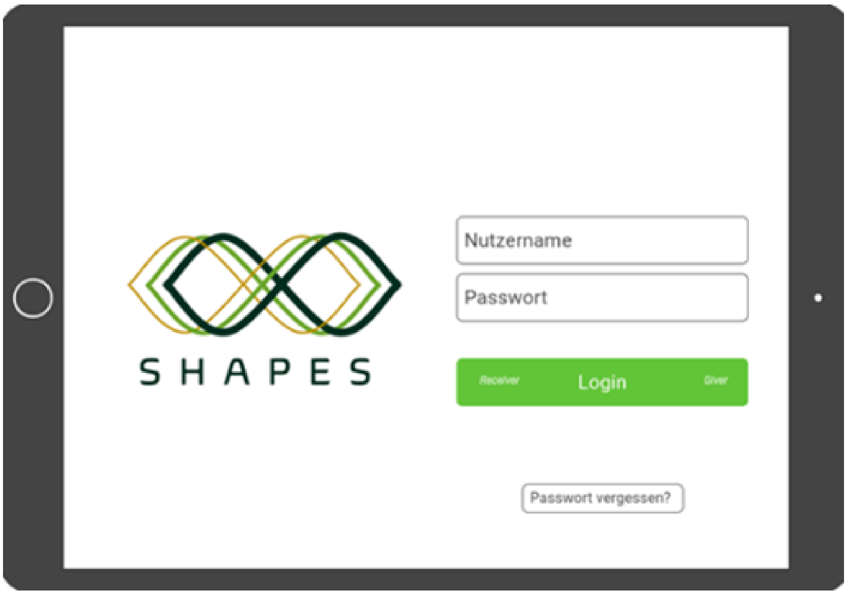

Figure 4: UC-PT1-001 Mock-up SHAPES Login

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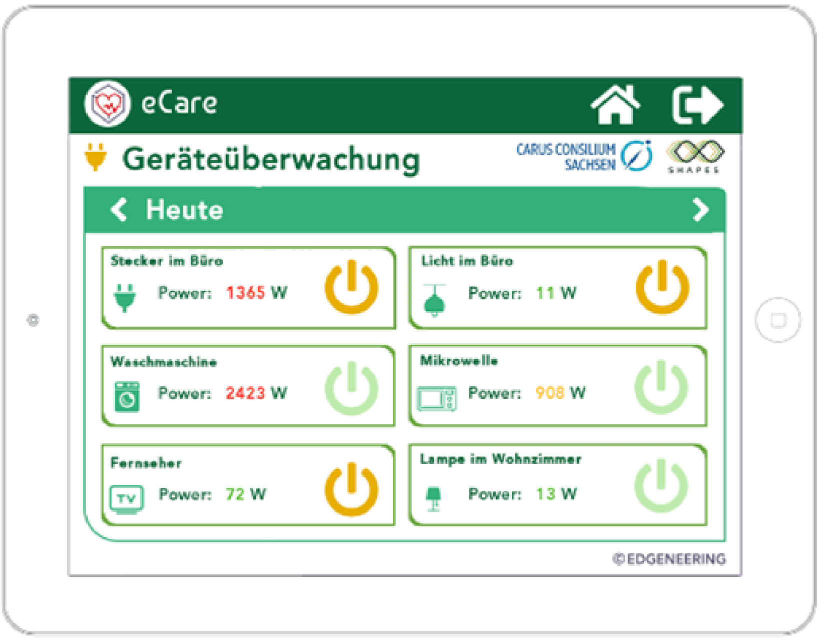

Figure 5: UC-PT1-001 Mock-up appliances monitoring

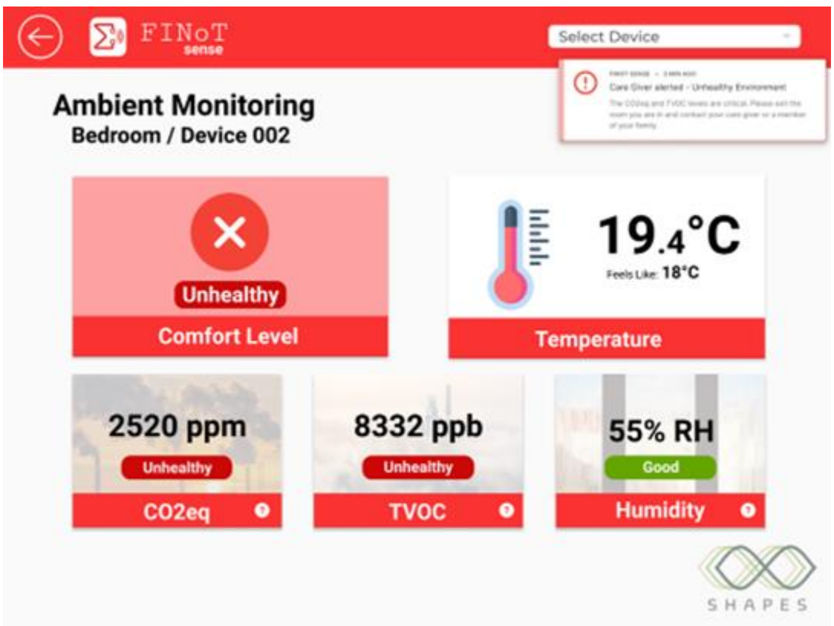

Figure 6: UC-PT1-001 Mock-up display air quality

After the presentations and the interviews, the participants were asked to fill in a questionnaire about UC001 at home. From 18 seniors participating in the hands-on experiments, CCS got back 15 (83.3 %) filled questionnaires. Answers given can be seen in the Annex 8.

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The following Table 11 summarizes the feedback and ideas of the seniors for the technical partners mentioned during the mock-up sessions.

Table 11: UC-PT1-001 Recommendations/Feedback of Mock-ups

Technical device / solution	Feedback
Smart Watch	• Individual adjustments/inputs or specifications must be possible • Are there value comparisons to individual optimal values? • Continued monitoring/measurement may make fearful people more fearful • How can I be reminded to put the watch back on if I have taken it off? • Can medication be entered? This also changes values - heart rate, for example • Distinguish between heartbeat and heartbeat variability - this allows conclusions to be drawn about the state of health • Measure stride length (short strides mean more risk, and thus lower life expectancy) • It is important that the watch is easy to read, i.e. the display must be as large as possible • Several forms of activity (e.g. swimming, cycling)
eCare	• Display is clear and understandable

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Wellbeing survey	• Daily questioning is too superficial • Deeper questions are missing - why do you feel like this today? • Nothing can be deduced from one question • Further questions are desired • Pay attention to unusual environmental influences, or create the possibility to enter them individually - e.g. construction site in front of the window • Include pain scale • Describe pain, where, how, why • Evaluation / statement, if always the same question is skipped in the 2 weeks questionnaire - conclusions from it
General	• Where are the recommendations displayed? • When alerting a relative or caregiver, the signal must drown out everything else • Blood sugar measurement is desirable • Oxygen saturation measurement desirable • Link to the general calendar is desirable • Everything has to be available in the mother language (German)

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2.7 *Phase 3: Hand-on Experiments*

2.7.1 Methodology of hands-on experiments

Aim

To collect feedback (user experience) from end-users by giving them the option to try the video consultation to be deployed in the use case PT1-001 in a prototype version.

Overview

Participants (older people, aged 65 years old and over) were invited to sessions with CCS personnel to take part in the hands-on experiments. The sessions were face-to-face. With users, group session with three to five participants were organised. The design was similar to the mock-up sessions. Each session took approximately 2.5 hours.

Participants

Phase 3 hands-on experiments were conducted with 17 participants. (i.e., ≥ 65 years' old). In general, we decided to conduct the individual phases of the pilot with the same group of participants. This way, the seniors feel included and valued in the development and creation process. They can follow and understand the individual development steps exactly. The feedback of the seniors is taken into account in all phases. The approaches of the Co-Creation Method are used. In the group of older participants, the genders are equal and almost equally distributed with 8 female and 9 male participants.

Informed consent for all participants was taken with the following format of signatures collected where appropriate:

- Typewritten
- An electronic representation of a handwritten signature
- Handwritten signature

Method

Before hands-on training with participants, personnel of CCS performed some tests of the different functionalities. The Phase 3 hands-on experiments with recruited participants were conducted between 15th February 2022 and 28th February 2022.

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Figure 7: UC-PT1-001 Hands on preparation, pair device

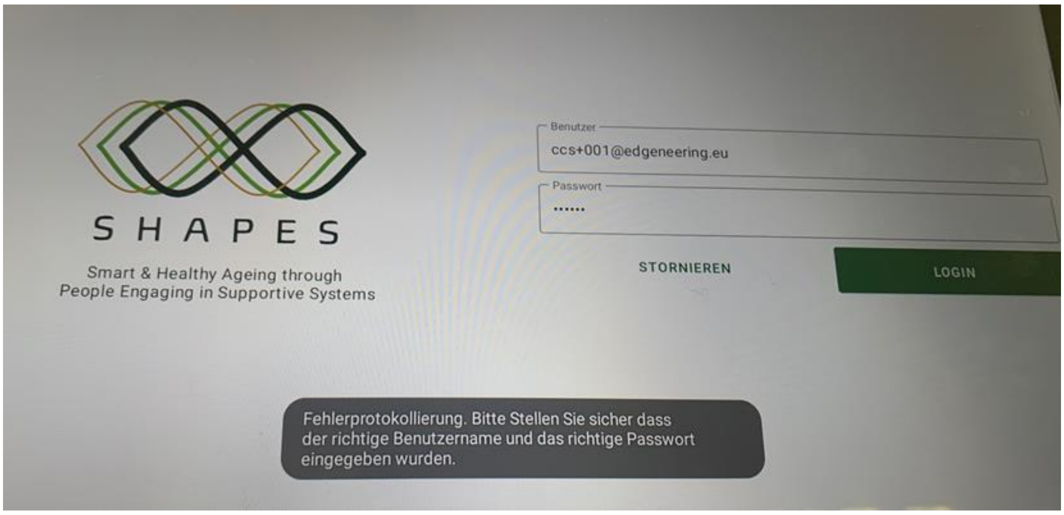

Figure 8: UC-PT1-001 Hands on preparation, test account

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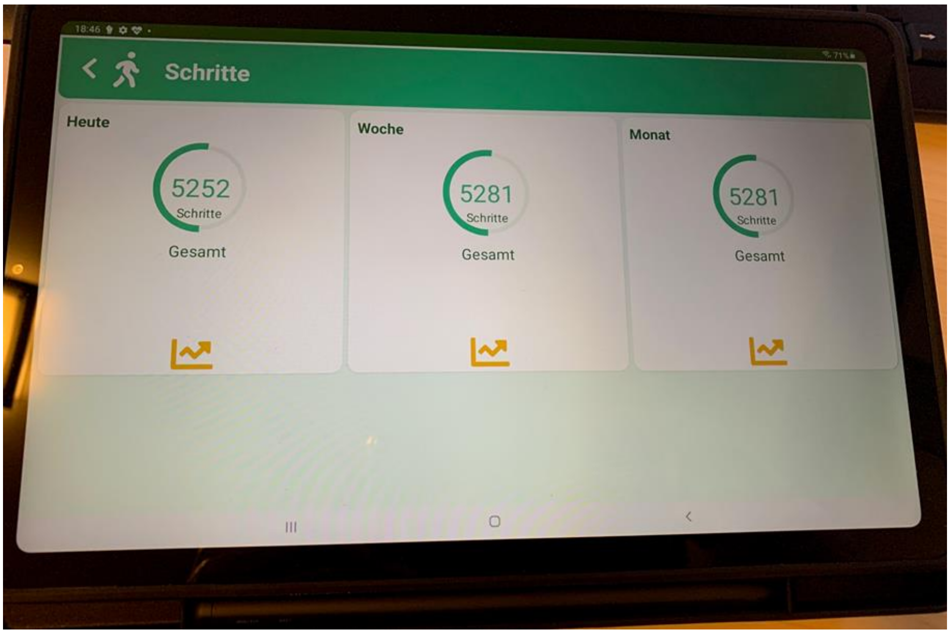

Figure 9: UC-PT1-001 Hands on preparation, test MiBand steps

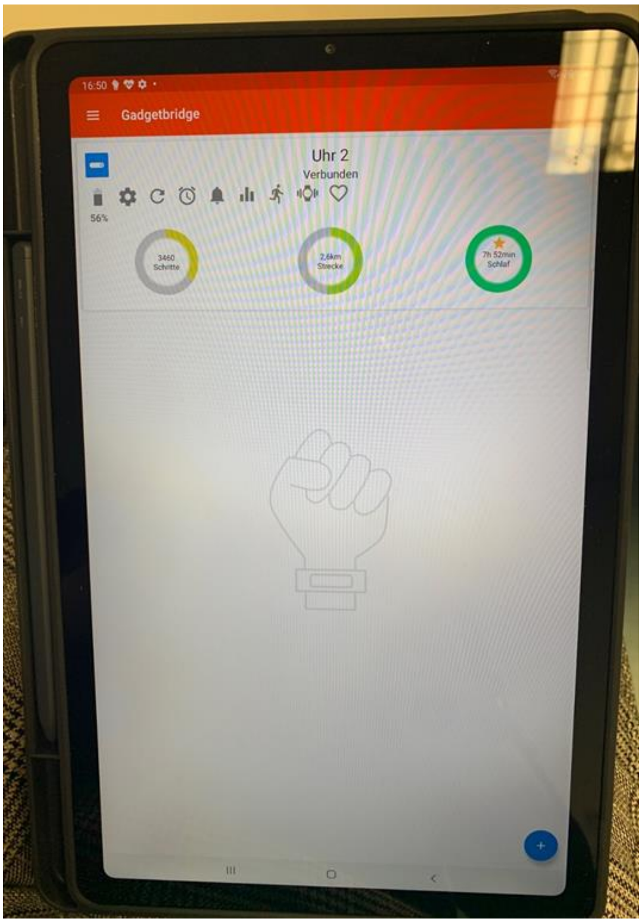

Figure 10: UC-PT1-001 Hands on preparation, gadgetbridge with steps and sleep

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Hands-on training at CCS

The digital solutions of UC001 were presented as functioning prototypes. The SHAPES project manager at CCS guided the participants' steps and tasks to use the platform and IoT devices. Instructions were given with the support of a presentation projected on a laptop screen or similar.

First, CCS discussed together with the participants which solutions / topics were presented in the last meeting (mock-up). Changes during the last seven months were explained in order to optimally integrate the participants into the development process and to increase the understanding of the complexity of the digital solutions.

All the Apps and accesses required for using the digital solutions were installed on the tablets. In this way, the work and tasks during the hands-on training were done exclusively on the tablet. The participants were able to use and try out the tablet independently. The participants are shown what the user interface of the SHAPES App and eCare looks like and which data is shown and analysed within this use case.

The smart watches were already worn a few weeks by the CCS staff before the training appointments in order to collect data. In this way, the participants could already be shown during the appointment how the data is processed and displayed in the application. During the hands-on training, the participants were able to wear and test the smart watch themselves. They were shown which functions the smart watch provides. They could also measure their heart rate manually and count steps by walking through the CCS building with the watch. Then the already existing and integrated analysis of this data were presented. This concerned the functions of steps and heart rate. The sleep analysis, as well as the anomaly detection were not yet integrated at that time and could therefore not be presented to the participants.

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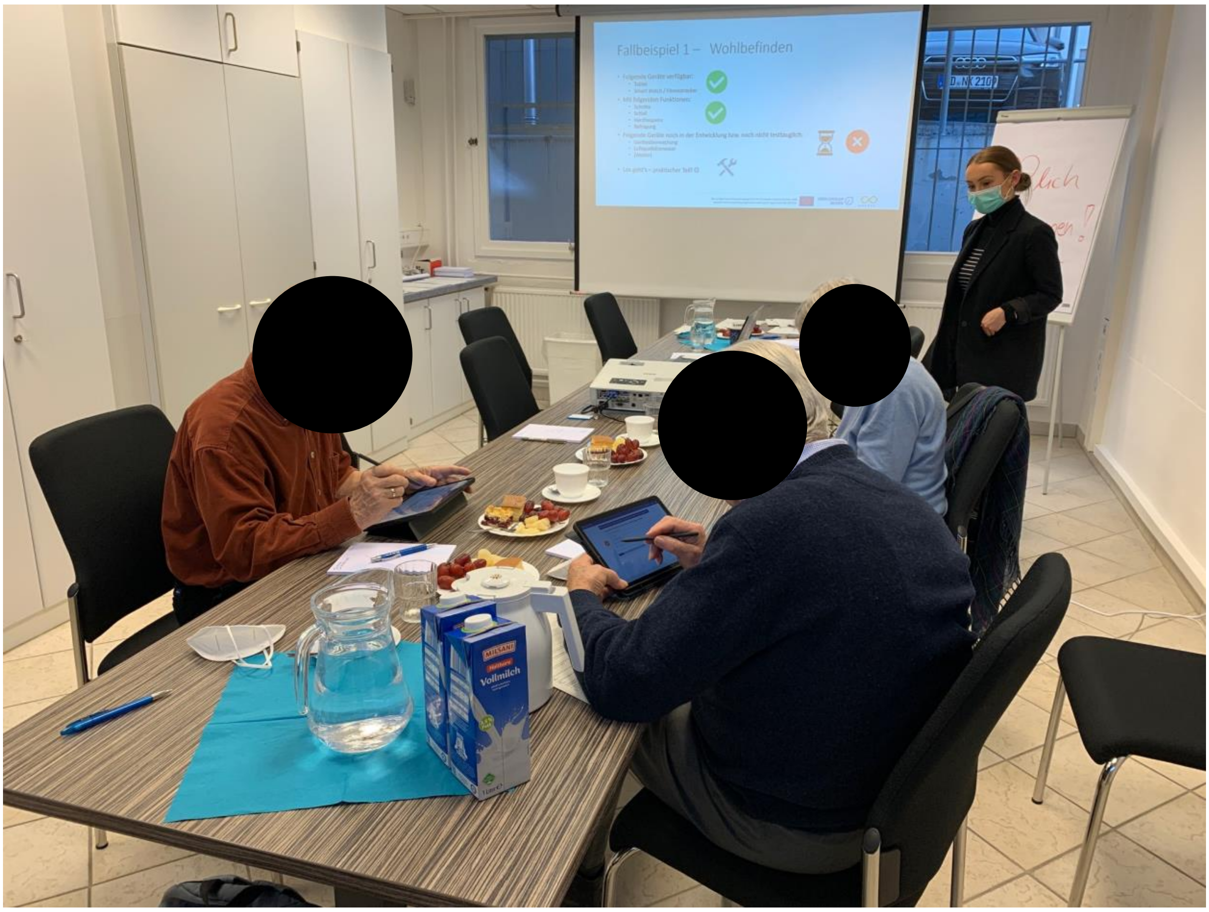

Figure 11: UC-PT1-001, Hands on meeting with recruited participants (1)

We were also only able to use a demo version for the demonstration of device monitoring, as the smart plug and gateway were not available. Nevertheless, we could show the participants how the user interface of the device monitoring is structured and which data / which status they can read from it, since we received a demo version from the responsible technical partner. The same applies to the weather information. We were also only able to provide the participants with a demo version.

Furthermore, the participants could fill in the two-weekly wellbeing survey. On the one hand, this allowed them to familiarise themselves with the devices, and on the other, to test an application.

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Figure 12: UC-PT1-001, Hands on meeting with recruited participants (2)

Figure 13: UC-PT1-001, Hands on meeting with recruited participants (3)

Feedback was collected at any time of the session by the project manager of CCS. Responses to each solution were captured using a simultaneous "think out loud" approach. The participants were encouraged to verbalise their reactions, thoughts,

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feelings, and opinions about the prototype throughout their engagement with the presenter. Notes were taken by the presenter (Annex 9).

Data analysis

A completed report, including practical recommendations, was presented to and discussed with technical partners and replicating sites.

2.7.2 Results of the hands-on experiments

As the majority of the participants are already working with smartphones, tablets and smart watches in their daily life, they mostly could handle and operate the presented devices and technology well. Participants with less experience needed a little more help and explanation. The front-end App and icons used were clearly structured and understandable. As the applications are not fully integrated yet and could not be used with just the SHAPES App, the seniors sometimes were a bit confused by five different Apps.

The participants were asked to fill in a questionnaire about UC001 at home. From 17 seniors participating in the hands-on experiments, CCS got back ten (58.8 %) filled questionnaires. Answers given can be seen in the Annex 10.

Lessons learned for phase 4

The tests made it possible to identify a series of problems, whose solutions can be from a technological point of view, or they can be from the point of view of the intervention framework (teaching strategies, the information provided to the participant e.g.), namely:

- Emphasize training issues.
- Adjust expectations and explain very well what usability tests consists of.
- Consider interviewing at the end to collect qualitative feedback
- Consider and minimize security issues.

Recommendations for technical partners

Table 12 contains the recommendations for technical partners from the Hands on sessions with the participants.

Table 12: UC-PT1-001 Recommendations for technical partners from the Hands on meetings

Technical device / solution	Improvement possibilities

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Smart watch	• Watch and letters are too small. Not easy to handle for seniors with possible handicaps. • Measurement of the temperature would be useful as it is part of health parameters. It is also necessary for the sleep quality. • Alarm system in case of falls. • For more precise statements about wellbeing and health data, the following parameters would be interesting: walking speed, stride length, asymmetric gait.
SHAPES App	• Graph of the heart rate analysis should be coloured. (green=good, red=bad)
Weather information	• Pollen count for allergic people. It could also be useful for recommendations for the air quality. • Rain radar.
Air quality monitoring	• Measurement of ozone, carbon monoxide, air pressure. • Prewarning levels. • Alarm notification on the smart watch (vibration and acoustic signal).
Device monitoring	• Switching devices on and off via the App.
Sleep analysis	• Temperature should be part of the analysis.
Activity analysis	• Differentiation between activities (e.g. walking, jogging, swimming, etc.).
Others	• Buttons (e.g. home, return) must be bigger in every application. • The contrast in the different applications could be more intense.

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2.8 Phase 4: Small Scale Live Demonstration

2.8.1 Recruitment of participants

Initially, it was planned to go also through this phase with the participants of the previous phases but based on the experience from phase 3 and other projects, we have decided to carry out phase 4 internally.

CCS wanted to make sure that everything is tested and checked for functionality before the recruited participants go into the live test. This should strengthen the seniors' sense of security. Uncertainties and frustrations should be avoided. From CCS´s point of view, this decision was exactly the right one. Due to the technical complexity and the integration of numerous digital solutions from different technical partners, phase 4 was very time-consuming. Numerous installation and test trials were carried out by CCS staff within phase 4.

The evaluation and consultation with the Technological partners took place closely. From CCS´s point of view, senior citizens would not have been able to handle and operate the digital solutions of the UC001 at this stage of development.

2.8.2 Technical aspects & Logistics

Validations

Several experiments and test scenarios were designed and carried out by the CCS internal staff before phase 5 in order to validate necessary aspects of the digital solutions.

Numerous feedback loops were run through with the technical partners in which hints were given regularly, inconsistencies were pointed out and new updates were tested repeatedly.

The equipment provided by the SHAPES partners, such as the smart plugs (OMN), gateways (FINT) and air quality nodes (FINT) were sent to CCS by the respective companies.

After phase 5, the technical equipment was sent to the replicating sites, again by CCS. Due to the limited number of technical devices, such as the air quality nodes and the gateways, the pilot at CCS could not take place in parallel with the replicating sites, but only after each other. The implementation at the replicating sites was also limited in the number of participants due to the limited availability of the technology.

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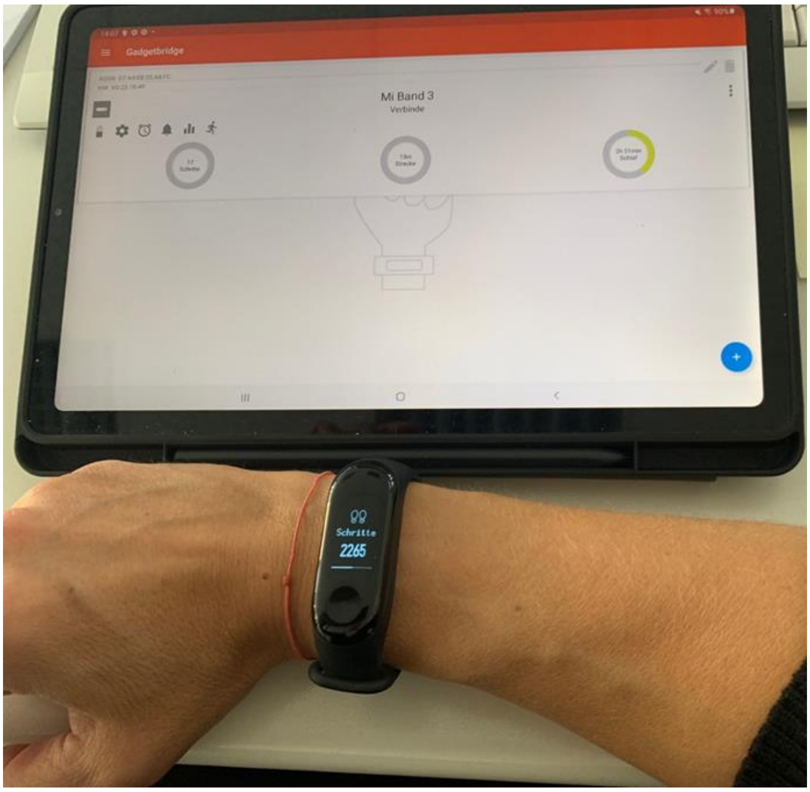

Figure 14: UC-PT1-001, phase 4 feedback-loops to tec partner, no data (1)

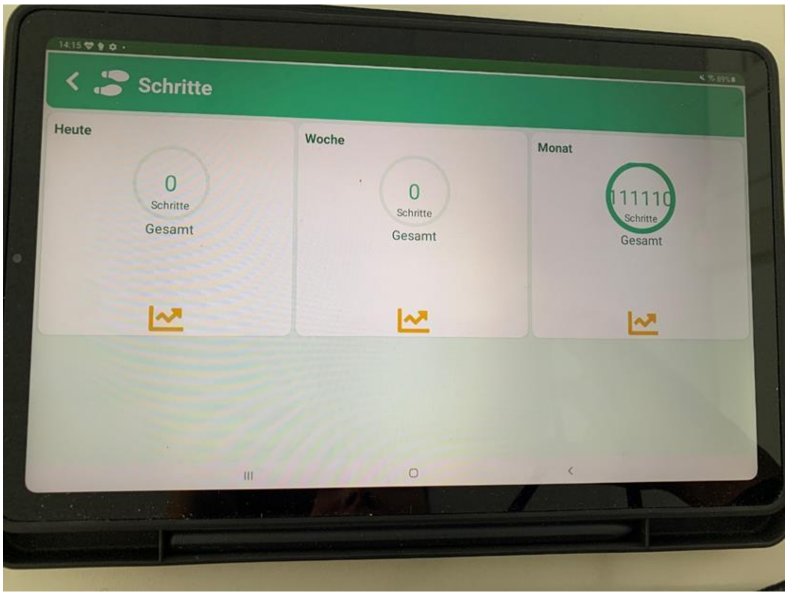

Figure 15: UC-PT1-001 phase 4 feedback-loops with tec partner, no data (2)

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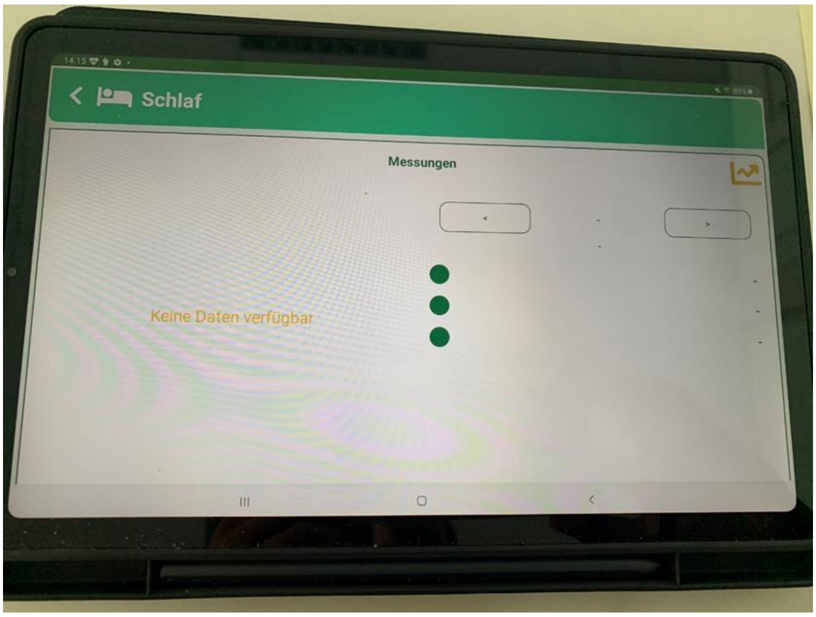

Figure 16: UC-PT1-001, phase 4 feedback-loops with tec partner, no data (3)

Training

Based on the experience of the very complex phase 4 of UC001, it became increasingly clear that the future participants in phase 5 would need much more support than originally assumed, since many applications are very complicated and prone to malfunctions.

This was one of the main reasons why we no longer assumed 15 participants, but 10, so that good support could be guaranteed. In order to gain or maintain the seniors' trust in the solution to be tested, good supervision is crucial from our point of view.

In addition to the number of participants, we have also restricted the selection of participants once again, as not every participant recruited in advance has the personal qualities to test these digital applications.

Besides of that the experiences from phase 4 were used to create a user manual about all the digital solutions used in UC001. (See Annex 11)

For every digital solution of UC001 a WIFI access was necessary.

2.8.3 Roles and Responsibilities

During phase 4, the CCS staff took on the different roles (care receiver and caregiver) and tested the corresponding functionalities with the help of different accounts.

2.8.4 Ethical considerations

An ethical self-assessment for phases 1–5 of this use case has been completed.

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Data Protection Impact Assessment (DPIA) was finished before the start of the pilot (including the data risk assessment).

Data Processing Agreements were finished before the start of the data collection. CCS is the data controller and, as such have access to the full dataset. Data Processing Agreements were in place to facilitate the sharing of pseudonymised data with specific SHAPES partners for specific purposes.

An ethical approval was not necessary in phase 4 because of the internal test.

2.8.5 Outcome of the Small-Scale Live Demonstration

The outcome of phase 4 from UC001 are the different feedback loops with the technical partners to improve the different solutions for use in phase 5. (See Annex 12)

Additionally to that we created a user manual for our participants about the handling and the functionality of all digital solutions used in UC001 in phase 5. (See Annex 11)

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2.9 Phase 5: Large-scale pilot activity lead CCS

A large-scale live demonstration of the SHAPES Platform and the digital solutions being deployed in the PT1-001 were undertaken during phase 5 of the SHAPES pan-European pilot campaign at CCS.

Implementing the SHAPES large-scale (Pan-European) pilot campaign aims to validate the SHAPES capabilities and benefits to care recipients, caregivers and care service providers across different regions, cultures and health and care organizational models. It also aims to assess the impact of SHAPES in supporting healthy ageing and independent living and the definition of improved integrated care policies and measures.

In phase 5, a pilot product-test with an optional qualitative interview component was conducted. This aims to determine the effectiveness of using the SHAPES platform and devices in order to increase the seniors' wellbeing by monitoring participants over more than eight weeks at their homes.

Phase 5 was evaluated at the beginning (baseline) and at the end of the pilot. A three months follow up evaluation was not possible due to the timeline.

The UC001 was planned to replicate by UAVR, CH, UCLM/SAL and AIAS.

2.9.1 Recruitment

Participants and sample size

In terms of evaluating the digital solutions, the target sample size for this pilot use case was 15 participants. These sample sizes were selected pragmatically to be as representative as possible of the target population, large enough to provide valid answers and within the scope of resources available.

As already described under phase 4, CCS decided to reduce the target size to 10 participants due to the complexity of the UC and the related increased need for supervision of our participants. This guarantees good support and guidance during the test phase 5. It is important to mention here that phase 5 was conducted in the real-life environment, this means in the participants' own homes. Due to the rather rural or suburban environment here in Saxony, this also required relatively long journeys in the course of the support. Support could often not be provided remotely but had to be carried out on the device itself together with the senior citizens at home. In retrospect, the decision to reduce the number of participants in order to maintain the quality of supervision during phase 5 was the right one.

In total, there were 9 care receivers, 2 care-givers and 2 researchers in total in the beginning of phase 5. During phase 5, one participant (care receiver) unfortunately

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dropped out due to private and technical issues. An explanation is be given in the document.

The 9 care receivers were between 68 and 83 years old and live either alone or with a partner independently in their own home (flat or house) in the east of Saxony. They are all self-sufficient. They mostly live in urban to suburban environments. In addition, the participants have different technical skills, from little experience with technology to high technical affinity. They all have access to WI-FI, and all were interested digitalisation. The caregivers are 33 and 41 years old and are not related to the participants. Both have experience with technical solutions for the ageing population in the home environment.

For the large-scale pilot activity of PT1, no new participants were recruited. The seniors from phase 2 and 3 continued to be part of the project and participate in the development process. In this way, continuity was ensured. Since the participants have been following the development from the very beginning, the co-creation approach can be used to further improve and adapt digital technologies. In addition, a consistent group of participants increases efficiency, as they already know each other and the collaboration with the CCS worked well. The seniors are already familiar with the features and challenges of the digital technologies developed within the project.

The recruitment process itself started already in phase 2 before the mock-up sessions. It was important for CCS to have a relatively stable group of participants throughout the whole development process, so that the development process can really be accompanied.

CCS performed several recruitment activities to create awareness for the project and to find suitable pilot participants for the testing. The following steps were taken by CCS to recruit participants for the pilot activities:

- Invitation of senior citizens to the information event “senior citizen café” through a newspaper advertisement;
- Newspaper advertisement in a free regional newspaper (“Wochenkurier”);
- Presentation to participants from other CCS projects (HoCare2.0, GATEKEEPER);
- Recruitment in the context of CCS public relations (CCS newsletter, LinkedIn, Xing, CCS website);
- Recruitment in the personal environment of CCS employees.
- Enquiry with the pilot participants who have already taken part in the CCS lead pilot site

First communication about the pilot has been conducted via senior citizen event from the research team to present all relevant information (see Annex 5) and answer questions from the potential participants. Afterwards information sheets and consent forms were sent out to eligible participants in case they still showed interest in the study.

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Eligibility criteria

Inclusion criteria:

- person aged 65 years old or older at the time of recruitment
- living in Dresden and the surrounding area (radius < 50km)
- living on their own or with a partner (cohabitation, marriage)
- self-reported capacity to use the App installed on the tablet
- self-reported capacity to consent
- has daily access to internet/Wi-Fi at home

Exclusion criteria:

- Lack of digital skills to use a tablet/smartphone
- Lack of internet access

As in the previous phases, a written consent form (Annex 6) and data security documents (Annex 7) were obtained from all participants before the pilot activities started. Signed by each participant and the original is stored in a locked cupboard at CCS premises. Only CCS staff has access to the originals. A copy was given to each participant.

In addition, all participants received an information sheet on the pilot action (Annex 13), training on how to use the digital solution and a manual summarising the relevant steps (Annex 11).

2.9.2 Communication and dissemination of pilot activities

Any data that arose from the pilot study are owned by CCS, with the support of MedicalSyn. On completion of the study, all data has been analysed and tabulated and used to prepare a final report— Deliverable D6.2. This deliverable (and all other agreed deliverables) is available to the public for review and accessible via the SHAPES website (www.shapes2020.eu). Participants are notified of the outcome of the study. CCS seeks to disseminate the findings from this study at conferences and in the scientific literature. Moreover, CCS disseminates the results of the pilot activities through CCS public relations (CCS newsletter, CCS website, LinkedIn, Xing). As per the SHAPES Publication Protocol, all publications arising from this study reflect the range of effort that has made them possible; including conceptualisation of the research project and research task, methodology development, data collection and analysis, interpretation and discussion of results; as well as project management. Any publications are read and meaningfully contributed to by all named authors. Participating SHAPES partners have the rights to use data from this study in their own analysis and dissemination plans. As detailed under ‘Access to Data’, Data Processing Agreements have been set up and signed by all partners to facilitate the sharing of pseudonymised data with specific SHAPES partners for specific purposes.

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The pilot participants receive a separate and summarised report in national language on the project results after the end of the project. This is an appreciation towards the participants. The participants have given their time, patience and experience to the project, so from our point of view it is still important to inform them about the results and outcomes of the project. The participants carry this information and the SHAPES idea into their community and contribute to its dissemination. This is good and beneficial for the sustainability of the project.

2.9.3 Risk management

All foreseeable data-related risks have been compiled into detailed risk assessment documents, which form part of the Data Protection Impact Assessments for Phase 5 PT1-001 conducted in CCS. A risk classification, root cause, name, and consequences were assigned for each risk identified. Once identified, each risk was then analysed and attributed a score from 1 (unlikely/minor) to 4 (almost certain/critical) for probability and impact. Subsequently, appropriate mitigation actions were assigned, and an appropriate person responsible was identified. These risks have been reviewed periodically during the deployment. The identified data risk can be found in Annex 14.

In addition to data risks, there are a few risks identified, namely:

- Recruit of participants – since participants in this pilot theme must be active and live in the community, it can be challenging to reach these people as the partner institutions in the health and social area deal mainly with older adults with some degree of disability which is not what we are looking for in this study.
- Adherence to the intervention due to digital literacy issues, demotivation, difficulties in physical coordination, cognitive difficulties, or lack of interest.
- Risks associated with technology functioning at participants' home - such as device malfunction or difficulties in assembling the equipment
- Risks related to health and wellbeing of participants; may be confused or disturbed by the air quality displays

2.9.4 Outcome of large-scale pilot activity

Overview

The phase 5 large-scale pilot of the SHAPES UC-PT1-001 was conducted by CCS between January 2023 and May 2023 with 13 participants.

- Socio-demographics of the participants (Table 13)

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Table 13: UC-PT1-001 Socio-demographics of the participants

Variables	Number of participants	Value
Age (years)	care receiver: 9 caregiver: 2 researcher: 2	Average age care receiver = 75,2 Average age caregiver = 37 Average age researcher = 38
Gender Male Female	 5 (CR) 4 (CR), 2 (CG), 2 (RE) = 8	 38,46 % (45,45 % without RE) 61,54 % (54,55 % without RE)
Technological skills:	Advanced: 9 (7) Beginners: 4	Advanced user: 69,23 % (63,63 % without researcher) Beginners: 30,77 % (36,36 % without researcher)
Country:	Germany	100%
Marital status: Married: Widowed: Other?	 7 2 4	 53.85 % 15.38 % 30.77 %
Occupational status: Retired Employed full time: Other?	 9 4	 69,23 % 30,77 %
Residence: House	 8	 61,54%

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Flat	5	38,46%

To evaluate the results of phase 5 various tools were used for the evaluation. The results were presented according to the following subdivision:

- *Primary and secondary outcomes*
- *Recommendation for technical partners*
- *Evaluation of use case by using MAST*

Primary and secondary outcome

Primary outcome

The primary outcomes were to measure a predefined set of KPIs which have already been presented in chapter 2.5.2 as well as to evaluate the UC-PT1-001 use case using the MAST evaluation tool.

Table 14 presents an overview about the KPIs for UC-PT1-001 (CCS piloting):

Table 14: UC-PT1-001 KPI Overview

	school grading system / grade 3 should always be achieved = KPI (min.)									
		1 = excellent		2 = good		3 = sufficient		4 = poor		5 = insufficient
PT1-UC001 KPI for phase 5		complies with		complies with		complies with		complies with		complies with
KPI 1: successful participant recruitment (target 10 participants)	1	10	2	9-8	3	7-6	4	5-4	5	< 4
KPI 2: How many recruited participants remainded enrolled in the pilot until the end of phase 5?	1	10	2	9-8	3	7-6	4	5-4	5	< 4
KPI 3: How many % of the offered 14-day questionnaires were fully completed (WHOQOL-OLD)?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 4: How many % of the offered daily questionnaires were answered?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 5: How many % of participants wearing the smartwatch during 60 % of the days?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 6: How many % of participants wearing the smartwatch during 60% of the night?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 7: How many % of all support cases during the test phase are serious cases? What are serious support cases? - System crash, user cannot log in, system does not collect data, support from/with TecPartners necessary, ...	1	5%	2	>5%-10%	3	>10%-15 %	4	>15%-20%	5	>20%
KPI 8: SUS Score (System Usability Scale)	1	Best Imaginable (100%)	2	Excellent (>80 %)	3	Good (80-60%)	4	Poor (<60%)	5	Worst Imaginable (<15%)
KPI 9 How many % of the participants are willing to use the digital solutions after the test phase?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 10: In general, how many % of the participants feel that it would be useful to develop a specific platform for healthy ageing?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
Summary						At least 70% of the KPIs must be met for the UC to be successful.				

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KPI 1 At least 60% of the target cohort were successfully recruited into the pilot during the recruitment period.

Table 15: UC-PT1-001 KPI 1

Parameter	Value
Target number of participants	10
Number of participants recruited	13
Percentage recruited	100%

The target of 10 participants was exceeded as two care givers and two scientists were recruited in addition to nine participants. The target was thus overachieved.

As already described in phases 3 and 4, we have decided to reduce the target size to 10 participants based on the experiences from the phases mentioned above. This ensured good supervision, support and guidance during the test period. The participants who had already been recruited in advance were once again selected by CCS with respect to a constant internet access at home and a certain technical affinity as a personal characteristic. Nine participants met these requirements, plus 2 care givers and 2 researchers. Even with the assumption that the researchers are not actually part of the study cohort, with a total of 11 participants (receiver and giver) the target number was reached or even exceeded.

KPI 2 At least 60% of recruited participants remained enrolled in the pilot until the end of the pilot.

Table 16: UC-PT1-001 KPI 2

Parameter	Value
Number of participants at baseline	13
Number of dropouts	1
Number of participants at the end of the pilot	12
Percentage retained	92,31%

One participant did not complete the pilot to the end. The reason was dissatisfaction with the technique used in UC-PT1-001 and being overwhelmed with the technology, especially the SHAPES App. In addition, there was a household accident. This put the participant out of action for a few days. This contributed to the participant being

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overwhelmed and frustrated with the overall situation and the perceived project demand. The participant then dropped out of the test phase.

KPI 3 At least 50% of the offered 2 weeks questionnaires (WHO-QOL OLD) were answered by the participants.

Table 17: UC-PT1-001 KPI 3

Parameter	Value
Number of offered 2 weeks questionnaires.	20
Number of completed 2 weeks questionnaires	10
Percentage of answered daily questionnaires	50%

The 3rd KPI was passed by a very narrow margin with 50% of questionnaires answered completely during the test period. The questionnaires have the proper requirement to be answered every 14 days or in a 14-day flashback. During the first implementation of the questionnaires, the participation and interest of the seniors was still quite high. The technical implementation was a problem for only a few of them. However, the interest and the willingness of the seniors to fill out the questionnaire completely decreased when the questionnaire was repeated several times. Comments, additions, descriptions, explanations, reasons. (Annex 15)

KPI 4 At least 50% of the offered daily questionnaires were answered by the participants.

Table 18: UC-PT1-001 KPI 4

Parameter	Value
Number of offered daily questionnaires.	214
Number of answered daily questionnaires	118
Percentage of answered daily questionnaires	55,1%

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The 4th KPI was successfully passed with 55.1% of surveys completed during the test period. The daily question was short, concise and simple. It was not time-consuming to answer and was easy to handle, so that despite the necessary daily application, more than half of the questions provided were answered. (Annex 15)

KPI 5: At least 50% of the participants wearing the smart watch during 60% of the days during the pilot.

Table 19: UC-PT1-001 KPI 5

Parameter	Value
Number of participants during pilot (care receiver)	8
Number of participants wearing the smart watch on 60% of total days	7
Percentage of participants wearing the smart watch during 60% of the days during the pilot.	87,5%

87,5 percent of the participants wore the smart watch and counted steps on at least 60% of the days of the test period. This KPI has thus been completed very successfully. Furthermore, those seniors who had a short absence during the test period due to illness, in most cases even wore the smart watch and counted steps during these absences, which is a great success. (Annex 16)

It should be noted that only care receivers, i.e. senior citizens, were considered in this context. In the context of the UC, only the care receivers had the task of wearing the smart watch and counting their steps on it. In general, it can be said that the seniors were very interested in the functionality of the smartwatch. The function of counting steps was largely assessed as positive and beneficial for the seniors, which is also reflected in the KPI.

In this context, sometimes the non-functioning display of the steps in the SHAPES App was frustrating. The persistent connectivity issues may have also played a role in the process.

KPI 6: At least 50% of the participants wearing the smart watch during 60% of the nights during the pilot.

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Table 20: UC-PT1-001 KPI 6

Parameter	Value
Number of participants during pilot	8
Number of participants wearing the smart watch on 60% of total nights	5
Percentage of participants wearing the smart watch during 60% of the nights during the pilot.	65,5%

65,5 percent of the participants wore the smart watch on at least 60% of the nights of the test period and recorded their sleep. This KPI was thus completed very successfully. Furthermore, even in this case, those seniors who had a short absence during the test period due to illness, in most cases even wore the smart watch at night during these absences and monitored their sleep, which is a great success. (Annex 16)

It should be noted here, analogous to KPI 5, that in this context only the care receivers, i.e. the seniors, were considered. In the context of the UC, only the care receivers had the task of wearing the smart watch and monitoring their sleep. In general, it can be said that the seniors were very interested in the functionality of the smartwatch. The sleep recording function with the different sleep phases was largely rated as positive and beneficial for the seniors, which is also reflected in the KPI.

In this context, the non-functioning display of the sleep data in the SHAPES App was frustrating. Unfortunately, there were also participants for whom the sleep function did not work and could not be fixed until the end. The persistent connectivity issues may have also played a role in the process.

KPI 7: A maximum of 15% of all support cases were serious support cases.

Table 21: UC-PT1-001 KPI 7

Parameter	Value
Number all support cases.	19
Number of serious support cases.	16
Percentage of serious support cases.	84%

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84 percent of all support cases were serious support cases (Annex 17). Serious support cases are those challenges or issues that the participants cannot solve on their own or with telephone support or remote assistance. In the majority of cases, serious support cases require on-site support or the involvement of Technical Partners. This was the case several times in this UC. Several digital solutions did not function properly until the end of the test phase. Due to the complexity of the UC, the integration of many different digital solutions from many different technical partners, the integration of all these applications on a common platform, the SHAPES App, was a challenge and could not be solved satisfactorily in some cases until the end of the test phase.

KPI 8 At least "Good" is the overall score in the System Usability Scale (SUS) about all participants.

Table 22: UC-PT1-001 KPI 8

Parameter	Value
SUS Score participant 3	82,5
SUS Score participant 4	25
SUS Score participant 5	62,5
SUS Score participant 6	67,5
SUS Score participant 9	22,5
SUS Score participant 10	75
SUS Score participant 11	87,5
SUS Score participant 15	32,5
SUS Score participant CG 20	22,5
SUS Score participant CG 21	22,5
Average SUS Score over all participants	**50,0**
SUS Score researcher 30	37,5
SUS Score researcher 31	37,5

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Average SUS Score over all participants inclusive researcher	**47,9**

The SUS score is only 50, or 47.9 if the researchers are also asked. This means that the KPI is not successful. There are significant usability problems within the tested applications. This is also reflected in the support cases, for example. The applications did not run stably. They were too prone to failure and did not work well together. (Annex 18)

This in turn affected the user experience for the participants and the usability.

KPI 9 At least 50 % of the participants are willing to use the digital solutions after the pilot phase.

Table 23: UC-PT1-001 KPI 9

Parameter	Value
Number of participants in total (care receiver and care**giver**)	10
Number of participants who are willing to use the digital solutions after the pilot phase.	6
Percentage	60%
Number of participants who are willing to use parts of the digital solutions (smart watch) after the pilot phase.	3
Percentage of participants who are willing to use parts or all digital solutions after the pilot phase	90%

90% of the participants (care receiver and caregiver) are willing to continue using the tested digital solutions on condition that necessary technical adjustments and further developments are made. Researchers were left out of this analysis, as we only wanted to look at the user perspective of this question.

The participants are therefore convinced of the usefulness and benefits of the digital solutions despite numerous technical difficulties. These contribute significantly to their subjective well-being.

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KPI 10 At least 50 % of the participants feel that it would be useful to develop a specific platform for healthy ageing.

Table 24: UC-PT1-001 KPI 10

Parameter	Value
Number of participants in total	10
Number of participants who feel that it would be useful to develop a specific platform for healthy ageing.	9
Percentage	90%

90% of the participants (care receiver and care giver) consider it useful to develop a platform for healthy ageing after the test phase. Researchers were left out of this analysis, as we only wanted to look at the user perspective of this question.

<u>Overview of KPI achievement</u>

Table 25: UC-PT1-001 KPI Overview

Key performance indicator	Achieved during large-scale pilot activity (yes/no)	Comments
KPI 1	Yes (100%)	School grade 1 - excellent
KPI 2	Yes (92,31%)	School grade 2 – good
KPI 3	Yes (50%)	School grade 3 – sufficient, the absolute minimum requirement has been reached
KPI 4	Yes (55,1%)	School grade 3 – sufficient, slightly more than the absolute minimum requirement has been reached
KPI 5	Yes (87,5%)	School grade 2 – good, tendency to excellent
KPI 6	Yes (65,5%)	School grade 3 – sufficient

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KPI 7	No (84%)	School grade 5 - insufficient
KPI 8	No (50%)	School grade 4 - poor
KPI 9	Yes (60%)	School grade 2 - good
KPI 10	Yes (90%)	School grade 1 - excellent

Overall KPI from this UC001 At least 70 % from all KPIs must be successful.

Table 26: UC-PT1-001 KPI Overall

Parameter	Value
Number of KPIs	10
Number of successful KPIs	8
Percentage	80%

The overall goal of this UC to successfully pass 70% of all KPIs was achieved and even exceeded with 80%. Only 2 KPIs could not be achieved, all others were achieved, albeit narrowly in places.

Thus, overall, one can assume a successful case study. Nevertheless, there is still a great need for further action and technological development. The two KPIs that were not achieved were user-friendliness/manageability and support vulnerability. These were the areas with the greatest difficulties. However, these points are absolutely necessary for a successful establishment.

<u>Conclusion:</u>

In summary, it can be said that there are no problems in recruiting participants, the motivation of the seniors is high. They consider digital support in healthy ageing to be helpful. They are willing to use the technology and do use it. However, there are still major problems in user-friendliness, usability and susceptibility to errors. Further developments are necessary.

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Evaluation of MAST

The MAST framework as already introduced in chapter 2.4.2 was used to evaluate the effectiveness and contribution of UC-PT1-001 to quality of care. The evaluated data/outcome are presented in the Table 27. A complete overview of the harmonised data can be found in Annex 19.

Table 27: UC-PT1-001 Evaluation of MAST

MAST Domain	Topic	Outcome	Baseline (mean/SD)	End of pilot (mean/SD)	Chang in mean (SD)
Clinical Effectiveness	Mental health	OSSS-3 (social support) and life events	M = 10,85 SD = 0,86 Med = 11 Min = 10 Max = 12 **"moderate social support"**	M = 10,92 SD = 0,86 Med = 11 Min = 10 Max = 12 **"moderate social support"**	1 dropout
	Effects on health-related quality of life	EQ-5D-5L VAS	**Health Status** M = 83,08 SD = 13,23 Med = 80 Min = 60 Max = 100	**Health Status** M = 84,17 SD = 13,20 Med = 80 Min = 60 Max = 100	1 dropout
		WHOQOL-BREF scores	**Domain 1** M = 27,77 SD = 4,90 Med = 26 Min = 19 Max = 34	**Domain 1** M = 28,5 SD = 4,37 Med = 27,5 Min = 21 Max = 34	1 dropout
			Domain 2 M = 25,69 SD = 2,99 Med = 25 Min = 20 Max = 29	**Domain 2** M = 26,17 SD = 2,61 Med = 26 Min = 21 Max = 29	1 dropout
			Domain 3 M = 8,46 SD = 1,55 Med = 8 Min = 6 Max = 10	**Domain 3** M = 8,67 SD = 1,43 Med = 9 Min = 6 Max = 10	1 dropout
			Domain 4	**Domain 4**	1 dropout

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			M = 35,07 SD = 2,97 Med = 35 Min = 28 Max = 38	M = 35,67 SD = 2,25 Med = 36 Min = 31 Max = 38	
Patient perspectives	Satisfaction and acceptance	User acceptance (TAM score)	/	**Ease of use:** M = NA SD = NA Med = NA Min = NA Max = NA	
				Future use: M = 3,42 SD = 0,95 Med = 3 Min = 2 Max = 5	
				Usefulness: M = 3,33 SD = 1,11 Med = 3 Min = 1 Max = 5	
	Understanding of information Confidence (in the treatment) Ability to use the application Access & Accessibility	Usability of application (SUS Scores)	/	M = 47,9 SD = 24,17 Med = 37,5 Min = 22,5 Max = 87,5 **<60% (M) = significant usability problems**	Incl. Researcher
		Usability of application (1-item health literacy)	M = 4,31 SD = 0,46 Med = 4 Min = 4 Max = 5	M = 4,33 SD = 0,47 Med = 4 Min = 4 Max = 5	

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	Empowerment Self-efficacy	Self-efficacy (GSES)	M = 31,08 SD = 1,59 Med =31 Min = 28 Max = 33	M = 31,33 SD = 1,37 Med =31 Min = 30 Max = 33	1 dropout
Economic aspects	Amount of resources used when delivering the application and comparators	Cost of devices (Cost as per device purchasing invoice)	• Tablet: 328,57€ • Protective cover tablet: 13,99€ • MiBand: 16,77€ • Air quality node: • Smart plugs: • Gateway: • LAN Cable:		
		Cost of using digital solutions and SHAPES platform	• Electricity (charging the tablet) • Wi-Fi connection: • Server Finot* • Server TREE* • Server MedSyn • Server eCare • Different applications: • SHAPES platform itself: • SHAPES Marketplace:		
		Cost of staffing (Timesheets and costing data)	• Training the users • Travel cost • Development updated version • Remote support via phone • Support in person		
*Not available as they were customized solution**,** and they aren't at a commercial stage as yet					

During the pilot timeframe, eCare collected a total of **111.613 measurements.** The distribution can be seen in Annex 65.

Secondary outcomes

During phase 5, the participants were provided with a diary in which they could record their impressions, experiences and observations with the digital solutions on a daily basis.

Furthermore, at the end of the phase 5, final interviews were conducted with the participants. These contained questions divided into four different categories:

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- Perception and understanding;
- Interaction / Intuition / Function;
- Design / Layout;
- General feedback.

The interview forms as well as a detailed overview of the answers given can be found in the Annex 20 and Annex 21.

Perception and understanding

To the general question of what SHAPES actually is for the participants in general, the answer came in almost all cases: a combination or compilation of new or existing technology to make life easier for seniors.

The functional applications were understandable and comprehensible for the participants and could also be used with some support. The visualisation still leaves room for changes, the lettering was too small in some places. Comparative values / benchmarks of the collected data are desired in order to be able to evaluate the data or the display. The Smart Watch was rated positively by many. The monitoring of steps and sleep is very interesting for many and encourages activity and an improved sleep routine, which in turn contributes to an increase in well-being. Furthermore, many participants would have liked to have information about the air quality, but in most cases, this was not technically feasible by the end of the test phase. The test devices did not work properly in almost all cases.

The participants were frustrated by the high susceptibility of the devices to malfunctions and the non-functioning of some devices (smart plugs, air quality node).

Interaction / Intuition / Function

For all participants, the handling was comprehensible and understandable, and all participants were able to find certain information.

There was dissatisfaction and lack of understanding about the non-working of some devices and applications (air quality node, smart plugs). Even after several exchanges, this problem could not be fixed.

Design and Layout

The design and layout were rated as okay by the participants. The main menu of the SHAPES app was evaluated as good and clear by many. However, the different layout and design of the individual sub-Apps was rated negatively and caused confusion during operation. The font was sometimes too small and the display of the smartwatch in particular was not suitable for senior citizens. The colour, contrast and display itself from the SHAPES App were rated as good. Only the non-functioning applications led to excessive demands.

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General feedback

In principle, almost all participants consider the SHAPES idea positive, useful and beneficial.

All seniors would like support on several levels, depending on their needs - starting with proper instruction on how the devices work, to a comprehensible user manual, to personal support. The functions steps, sleep and air quality are considered useful by almost all participants, whereas the functions on appliances' monitoring with the smart plugs are rated as less useful. However, the reason for this can also be found in the lack of functionality.

There was disagreement when answering the question whether the participants would be willing to pay money for the SHAPES App and the individual applications in the future. Here, opinions differed greatly. Various suggestions were made as to the conditions under which the participants would be willing to pay: the cost-benefit ratio must be right, many would like a free trial period.

Furthermore, in the first step, all applications have to work, be intuitive and easy to use and bring a recognisable individual benefit for the respective user.

Recommendations for tech-partners during and after the pilot

During the test phase, there were several feedback rounds with the technical partners. Using screenshots, problems, recommendations, hints and wishes were expressed and communicated to the technical partners.

The technical partners tried to solve the problems and implement the requests. This was often connected with necessary updates of the applications. In addition, the smart plugs were exchanged several times.

Final recommendations:

- All applications should work and pass data to the right places
- All individual applications in the same layout and design
- All applications should be found under the same interface and access; no different links to different applications
- intuitive handling
- One-time registration with an ID or an account, allowing access to all individual applications without having to register again.
- Clear and simple labelling of the diagrams
- Integration of comparative values / benchmarks
- Possibility to set own goals
- Different applications / devices must communicate with each other
- Applications can be selected according to needs

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- Allergic weather could be integrated into the weather application
- The smart watch should distinguish between different activities
- The smart watch itself should be senior-friendly, i.e. easy to set up, large, clear display.
- The air quality meter should give recommendations regarding the air quality.
- The user should be able to receive recommendations as needed
- Basic differentiation of applications into wellbeing / smart home solutions and medical products; the barriers and requirements for use and testing are very different in these areas.
- Use of applications that are state of the art; many applications already exist in a highly developed state on the market.

Overall, there is still a lot of room for further development.

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2.10 Phase 5: Large Scale Pilot Activity replicating site SAL/UCLM

Overview about replicating site:

Table 28: UC-PT1-001 Replicating site SAL/UCLM

Replicating site	
Name	Asociación Benéfico Social El Salvador / Universidad de Castilla-La Mancha
Shortcut	SAL/UCLM
Location	Ciudad Real (Spain)
Participants involved in replicating of this UC (Number in total)	5
Participants in the role of a care receiver Number	5
Participants in the role of a caregiver Number	1
Participants in the role of a researcher Number	1
Duration of replicating (days)	15 days

2.10.1 Recruitment

The recruitment process was carried out among the two organisations participating in the replication (SAL+UCLM), as experts in the domain. Five researchers participated in the UC replication, adopting some of them the role of caregiver and researcher, apart from the role of care receiver.

The living environment of all the participants consists in a house, shared with other individuals.

Because the protocol could not be submitted for the ethical approval, no informed consent were gathered as all participants were researchers of the project.

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2.10.2 Communication and dissemination of pilot activities

This use case has been part of the overall communication strategy of SHAPES and has been included in various presentations and publications.

2.10.3 Risk management

There were several risks that had to be addressed during the replicating site. The first risk was the impossibility to acquire, from the market, the version of the smart band that was initially considered for this use case. This risk was successfully addressed by adapting the software to the next version of the smart band (Mi Band 4).

The next risk that was identified and properly addressed was the ethical approval. Due to technical problems already encountered with the pilot lead, there were delays in the schedule and the replication was delayed. The protocol for the replication site could not go through the ethical approval since a minimum of 6 months are required to do so. This risk was properly addressed by conducting the replicating site with researchers.

Finally, the last risk was the technology malfunctioning or errors. Due to the tight schedule, this risk could not be properly addressed, and several technologies experienced errors that could not be overcome. There were already a number of technical problems with the pilot, some of which could only be solved with a great deal of effort (both in terms of time and personnel). The same problems arose during the replication and could not be solved sufficiently due to the tight time schedule.

2.10.4 Outcome of large scale pilot activity

Overview

Five researchers conducting the replicating use case for 15 days. The harmonised questionnaires were employed as due to several technical issues the daily evaluation questionnaires were not available.

Results from the final interview with the participants after the pilot revealed valuable insights regarding their perception and understanding, interaction/intuition/function, appearance/layout, and general feedback. Participants expressed diverse perspectives on these aspects, highlighting both positive and constructive feedback.

In terms of perception and understanding, participants demonstrated varying levels of comprehension and familiarity with the technology. While some found the concepts and functionalities intuitive and easy to grasp, others expressed the need for more guidance and clarification. Overall, the pilot was successful in creating a basic understanding of the technology, but further support and educational resources were requested by certain participants.

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Regarding interaction, intuition, and function, participants generally appreciated the seamless and user-friendly nature of the applications. The integration of smart devices, wearables, and remote monitoring systems allowed for convenient and efficient interaction. Many participants found the functionalities intuitive and were able to navigate the interfaces with ease. However, a few participants suggested minor improvements to optimize specific functions and enhance user experience.

In terms of appearance and layout, the visual design of the applications received mixed feedback. While some participants found the visualizations attractive and engaging, others expressed a preference for more aesthetically pleasing and visually appealing interfaces. However, it was widely acknowledged that functionality and clarity were more important factors, and participants emphasized the need for clear and easy-to-understand displays of information.

In general feedback, participants appreciated the positive impact of the pilot on their well-being and independence. The personalized and user-centric approach was highly valued, as it allowed for tailored experiences and addressed specific needs. Participants expressed gratitude for the convenience, control, and insights provided by the technology, which contributed to their overall satisfaction.

Overall, the final interview with participants after the pilot indicated a positive perception and understanding of the technology, with intuitive interaction and functions being well-received. While the visual appearance and layout received mixed feedback, the focus remained on functionality and clarity. The general feedback highlighted the significant positive impact on well-being and independence, reinforcing the value of personalized and user-centric approaches in digital healthcare solutions.

Recommendations for tech-partners during and after the pilot

The following recommendations have been identified:

- eCare Application Compatibility: For the purpose of the pilot, the eCare application supported version 3 of the Xiaomi MiBand smart band, a decision made to ensure that the smart band’s data was fully controlled by the SHAPES Consortium, without using third-party systems or cloud environments. Version 3 of the MiBand is currently not the most up-to-date variant. Therefore, there were difficulties in the procurement as well as the user-friendliness of the smartwatch. Newer models are usually easier to handle, especially for seniors.
- Single App Integration: Users currently need to install several Apps to gather data, which can be a cumbersome process. The technical team should consider integrating these functionalities into a single App for better user experience and more efficient data management.
- Smart Plugs Security: Requiring users to provide their credentials to integrate the smart plugs into the SHAPES App poses a serious security risk. It is recommended to work on an alternate integration method that does not compromise user security.

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For example, using OAuth or other secure authorization methods can help protect user information.

- Language Translation: The questionnaire application being in German limits its accessibility to non-German speaking users. Modern web development practices make language translation relatively straightforward, so it's crucial to provide versions in other commonly spoken languages. This makes the application more inclusive and user-friendly.
- Air Quality Sensor Connectivity: The current requirement for the air quality sensor to be connected via an Ethernet cable is restrictive. The technical team should look into developing wireless connectivity options to enhance usability and flexibility.
- Data Transfer to Data Lake: The failure to send data to the data lake is a significant issue. A thorough review of the data transfer protocols should be conducted to identify and rectify any bottlenecks or issues causing this failure. This might involve improving network connectivity, reconfiguring the data transfer protocols, or upgrading the data storage and processing capacities.

In light of our experience with the pilot solutions, it is important to express candidly that the current offerings do not seem to provide any distinctive advantages over existing products in the market. Despite our concerted efforts, the solutions we've tested have consistently demonstrated a range of challenges, from functional issues to decoupling problems. This suggests a significant gap between where we currently stand and the standard set by the market. Referring to the researchers, one of the most pressing concerns is usability, which appears to have been overlooked in the development process. Given the target demographic of older adults, many of whom may not have advanced knowledge of technology, this is a critical shortcoming. The complexity of the solutions, coupled with their lack of user-friendly design, makes them inaccessible to the very users they are intended to serve. It is crucial that we address these issues if we are to create products that not only compete or work as an inspiration in the current market but are also truly beneficial to our intended users.

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2.11 Phase 5: Large Scale Pilot Activity replicating site CH

Originally, Clinica Humana, Spain (CH) was also planned as a replication site for UC-PT1-001. Due to the difficult recruitment measures and the already high number of UCs carried out by CH, it was decided together with Fraunhofer Gesellschaft (FhG), as the WP6 leader, to release (CH) from replicating UC001 and UC002.

2.11.1 Recruitment

The recruitment measures proved to be very difficult due to the underlying target group. The following reasons led to CH not being able to replicate the UC001:

Lack of interest and willingness from individuals to participate, leading to an insufficient sample size for conducting the research. CH contacted potential participants among Humana's patients on the island of Mallorca, however, not all patients were eligible to participate for their particular health situation. Moreover, CH led 4 Use Cases within SHAPES and potential participants had already been contacted to participate in those other Use Cases and they were not willing to participate in another one.

CH also provides healthcare to patients in residential care homes, however, for Use Cases UC-PT1-001, participants had to live at their own homes, which was another limitation to find potential participants for this replication.

Three of the participants contacted were willing to participate, however, when we explain them the Use Cases in more detail, all of them got scared regarding the data collection methods, they didn't like the idea of having sensors installed in their homes to monitor their daily living activities. Some of they said that they had to discuss it with their relatives and the research team from CH contacted families of potential participants to explain the data security measures, explaining that GDPR and ethics were in line, however, all of them refused to participate.

These points were discussed with the pilot lead (CCS) and the WP6 lead (FhG) and it was decided that CH does not need to replicate UC-PT1-001 under these circumstances.

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2.12 Phase 5: Large Scale Pilot Activity replicating site UAVR

Overview of replicating site:

Table 29: UC-PT1-001 Replicating site UAVR

Replicating site	
Name	University of Aveiro
Shortcut	UAVR
Location	Campus Universitário Santiago 3800-193 Aveiro - Portugal
Participants involved in replicating of this UC (Number in total)	4
Participants in the role of a care receiver Number	 4
Participants in the role of a caregiver Number	NA
Participants in the role of a researcher Number	NA
Duration of replicating (days)	Approximately 15 days

2.12.1 Recruitment

For the replication of UC-PT1-001 at UAVR, four participants were selected to test the functionalities and usability of the digital solutions. The participants selected are domain experts in gerontology and physiotherapy with more than seven years of experience with older adults and working on research projects that aim to develop assistive technologies for older adults.

The option to select participants with this profile, instead of older adults, was because the technological solution was still in an early stage of development and translations were not available in a timely manner to engage older adults.

Therefore, since there were difficulties in getting the solutions to work properly and limitations in the availability of applications in the participants' languages, we decided

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to involve domain experts who had extensive knowledge of older adults' characteristics and on their needs and expectations regarding technological solutions. They were asked to evaluate the technology from the perspective of older adults and to use their knowledge of the target group to assess digital solutions.

2.12.1.1 Eligibility criteria

Participants were included if:

- Domain experts in Gerontology or Physiotherapy;
- Had at least 5 years of experience working with older adults;
- Had experience in the field of assistive technologies for older adults (either on their development or evaluation);
- Had access to the Internet;
- Signed the informed consent;
- Accepted to use/install the devices at their homes.

2.12.1.2 Technical Aspects & Logistics

The technical and logistical aspects included the following:

- Each participant received a tablet – Samsung Galaxy S6 Lite, a Fitness tracker Xiaomi Band 3, two Omnitor NOT!FY Smart Plugs, one FINoT Indoor Air Quality Node, and a one FINoT gateway.
- Each participant was asked to use the Xiomi Band 3 continuously through day and night. The researchers went to each participant's home to install the other devices.
- Every week, the researcher made a phone call to each participant to gather feedback about the user experience, and device operation.
- A log of all requests for support was kept and analysed after the pilot.

2.12.2 Communication and dissemination of pilot activity

Presentation of the results as part of the process of assessment can be considered. Demonstrations may also be conducted with older adults and their caregivers, once the technology is fully functional.

2.12.3 Risk management

Table 30 presents the risks identified in phase 5 of this pilot and the strategies used to mitigate them.

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Table 30: UC-PT1-001 (Replicating UAVR) Risk Management

Risk	Mitigation strategy
Difficulty recruiting participants	To mitigate the risk of recruitment difficulties, we had planned to increase the number of institutions contacted to present the project.
Risks associated with technology malfunctioning: such as device malfunction, difficulties assembling the equipment, or the set-up.	Continuous communication was established with the technical partners to minimize the risks associated with technology.

2.12.4 Outcome of large scale pilot activity

Overview

- Socio-demographics of the participants

Table 31: UC-PT1-001 (Replicating UAVR) Sociodemographics of participants

Variables	Number of participants	Value
Age (years)	4	Average age 37.8
Gender	Female - 4	100%
Technological skills:	4	Advanced user: 100% advanced
Domain expert area of specialization	Physiotherapy - 3 Gerontology - 1	Physiotherapy -75% Gerontology -25%
Country:	Portugal - 4	Portugal - 100%
Marital status:	Married - 4	100%

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Occupational status:	Employed full time – 4	100%
Residence: What kind?	Urban-3 Suburban-1	Urban-75% Suburban-25%

Several instruments were used at this phase to assess participants: the WHOQOL-BREF [1][15], EQ-5D-5L [3], the General Self-Efficacy (GSE) [4], the Oslo Social Support Scale (OSSS-3) [5], the Single-item Health Literacy Measure, the participation questions, the System Usability Scale (SUS) [6][7] and the three questions from the Technology Acceptance Model [8]. These are detailed below, and the respective outcomes are listed in Table.

The WHOQOL-BREF measures the quality of life of individuals and populations and is a shorter version of the WHOQOL-100 developed by the World Health Organization. It is a self-administered questionnaire that comprises 26 questions on the individual's perceptions of their health and well-being over the previous two weeks. Responses to questions are on a 5-Point Likert scale where 1 represents "disagree" or "not at all" and 5 represents "completely agree" or "extremely". The WHOQOL-BREF covers four domains each with specific facets, including physical health, psychology, social relationships, and environment and the final score varies between 0 to 100 [1][2].

The EQ-5D-5L is a standardised measure of health-related quality of life that consists of two parts: the EQ-5D descriptive system and the EQ visual analogue scale (EQ VAS). The descriptive system comprises five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension has five levels: no problems, slight problems, moderate problems, severe problems, and extreme problems. The patient is asked to indicate their health state by ticking the box next to the most appropriate statement in each of the five dimensions. This decision results in a 1-digit number that expresses the level selected for that dimension. The digits for the five dimensions can be combined into a 5-digit number that describes the patient's health state. The EQ VAS records the patient's self-rated health on a vertical visual analogue scale, where the endpoints are labelled 'The best health you can imagine' and 'The worst health you can imagine'. The VAS can be used as a quantitative measure of health outcomes that reflects the patient's judgment [3].

The GSE is a ten-item scale that assesses the strength of an individual's belief in his/her ability to respond to novel or difficult situations and to deal with any associated obstacles or setbacks. It uses a Likert scale with a 4-Point scale ranging from 1 (not at all true) to 4 (exactly true). A total score, on a scale of 10 to 40, or a mean scale

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score, on a scale of 1 to 4, can be calculated. Higher scores indicate higher perceived general self-efficacy and lower scores indicate lower perceived general self-efficacy [4].

The OSSS-3 is a 3-item self-reported measure of the level of social support [5]. It consists of three items that ask for the number of close confidants, the sense of concern from other people, and the relationship with neighbours, focussing on the accessibility of practical help. The final score ranges from 3 to 14, with high values representing stronger social support and lower values representing poorer social support. The OSSS-3 sum score can be operationalized into three broad categories of social support: a) 3–8 poor social support, b) 9–11 moderate social support, c) 12–14 strong social support [5].

Health literacy was assessed with a single question: “How confident are you filling out medical forms by yourself?”, answered using a 5-Point Likert scale that varies from not at all, to extremely confident [9].

The SUS is a 10-item scale to evaluate self-reported usability and is considered a gold standard in usability evaluation [6][7]. Each item is scored on a 5-point Likert scale and the final score ranges from 0 to 100, and higher values indicate better usability. Usability above 68 is considered acceptable and any value below 68 has the potential for improvement.

The three TAM questions evaluate technology acceptance based on the Technology Acceptance Model [8]. The three questions based on the TAM [8] are: i) The technology is easy to use?; ii) Is this technology useful to me?; iii). If this technology was available to me in the future, I would use it?, were scored on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The total score ranges from 3 to 21.

In addition to these instruments, log files were also collected to have information regarding the system’s use, and interviews were performed with participants at the end of the pilot to gather their perceptions on the usability and acceptability of the technology.

Table 32: UC-PT1-001 (Replicating UAVR) Outcome of the large-scale pilot activity

Instrument	Outcome
Log files and remote monitoring of the system use	System Use: Information on the number of accesses, session duration, and number of errors.
Semi-structured interview guide	Perception of participants towards the technology usability and acceptability.
WHOQOL-Bref	Quality of life

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EQ-5D-5L visual analogue scale (EQ-5D & VAS)	Health-related quality of life
GSES	Self-efficacy
OSSS-3	Social Function
1-item health literacy measure	Health literacy
TAM	Technology acceptance
SUS	Self-perceived usability

Primary and secondary outcomes

Primary outcome

The primary outcomes were to measure a predefined set of KPIs as well as to evaluate the UC-PT1-001 use case using the MAST evaluation tool.

The following tables present the data used to determine the success of each KPI. Table 33 provides an overview of the success of the pilot with regards to KPIs.

Overview about KPIs (CCS piloting):

Table 33: UC-PT1-001 (Replicating UAVR) KPI Overview

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	school grading system / grade 3 should always be achieved = KPI (min.)									
		1 = excellent		2 = good		3 = sufficient		4 = poor		5 = insufficient
PT1-UC001 KPI for phase 5		complies with		complies with		complies with		complies with		complies with
KPI 1: successful participant recruitment (target 10 participants)	1	10	2	9-8	3	7-6	4	5-4	5	< 4
KPI 2: How many recruited participants remainded enrolled in the pilot until the end of phase 5?	1	10	2	9-8	3	7-6	4	5-4	5	< 4
KPI 3: How many % of the offered 14-day questionnaires were fully completed (WHOQOL-OLD)?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 4: How many % of the offered daily questionnaires were answered?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 5: How many % of participants wearing the smartwatch during 60 % of the days?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 6: How many % of participants wearing the smartwatch during 60% of the night?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 7: How many % of all support cases during the test phase are serious cases? What are serious support cases? - System crash, user cannot log in, system does not collect data, support from/with TecPartners necessary, …	1	5%	2	>5%-10%	3	>10%-15 %	4	>15%-20%	5	>20%
KPI 8: SUS Score (System Usability Scale)	1	Best Imaginable (100%)	2	Excellent (>80 %)	3	Good (80-60%)	4	Poor (<60%)	5	Worst Imaginable (<15%)
KPI 9 How many % of the participants are willing to use the digital solutions after the test phase?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 10: In general, how many % of the participants feel that it would be useful to develop a specific platform for healthy ageing?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
Summary						At least 70% of the KPIs must be met for the UC to be successful.				

The following tables present the data used to determine whether each pre-defined KPI was successfully attained.

KPI 1 At least 60% of the target cohort were successfully recruited into the pilot during the recruitment period.

Table 34: UC-PT1-001 (Replicating UAVR) KPI 1

Parameter	Value
Target number of participants	4
Number of participants recruited	4
Percentage recruited	100%

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KPI 2 At least 60% of recruited participants remained enrolled in the pilot until the end of the pilot.

Table 35: UC-PT1-001 (Replicating UAVR) KPI 2

Parameter	Value
Number of participants at baseline	4
Number of withdrawals	0
Number of participants at the end of the pilot	4
Percentage retained	100%

All participants remained engaged in data collection until the end of the pilot.

KPI 3 not relevant for replicating site

The technical partner did not offer or provide the module for replication.

KPI 4 At least 50% of the offered daily questionnaires were answered by the participants.

Table 36: UC-PT1-001 (Replicating UAVR) KPI 3

Parameter	Value
Number of offered daily questionnaires.	0
Number of answered daily questionnaires	0
Percentage of answered daily questionnaires	0%

The questionnaires were not filled out because initially they were not appearing in the application, and later because they were in German, and none of the participants was able to understand German.

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KPI 5: At least 50% of the participants wore the smart watch 60% of the days during the pilot.

Table 37: UC-PT1-001 (Replicating UAVR) KPI 4

Parameter	Value
Number of days during the pilot (in total)	15
60 % of total days	9
Number of participants during pilot	4
Number of participants wearing the smart watch on 60% of total days	4
Percentage of participants wearing the smart watch during 60% of the days during the pilot.	100%

The pilot lasted for 15 days. Throughout this period, certain technical devices were operational, while others were not. The App effectively gathered data from the Xiaomi Band 3 and accurately displayed the collected information. The smart plugs also performed well in collecting data. However, it was only towards the end of the 15-day period that the gateway and the air quality node started functioning, resulting in a shorter data collection timeframe for these devices.

KPI 6: At least 50% of the participants wore the smart watch 60% of the nights during the pilot.

Table 38: UC-PT1-001 (Replicating UAVR) KPI 5

Parameter	Value
Number of nights during the pilot (in total)	15
60 % of total nights	9
Number of participants during pilot	4
Number of participants wearing the smart watch on 60% of total nights	4
Percentage of participants wearing the smart watch during 60% of the nights during the pilot.	100%

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All participants used the smart watch almost every day. There were only sporadic forgetfulness incidents in cases where participants took off the smartwatch to shower and then forgot to put it back on. These forgetful instances did not exceed three nights per participant.

Despite using the smart watch, participants mentioned that it was not accurate in measuring sleep hours, which would demotivate them from using it during the night if they were not part of the study.

KPI 7: A maximum of 15% of all support cases can be serious support cases.

Table 39: UC-PT1-001 (Replicating UAVR) KPI 6

Parameter	Value
Number all support cases.	15
Number of serious support cases.	6
Percentage of serious support cases.	40%

Support was requested 15 times by the participants, 6 of which were due to issues that prevented the use of the technologies (serious cases). Out of these, 6 support cases, 2 occurred because the App was not displaying data from the Mi Band (syncing problems), and the other 4 were due to difficulties in connecting the smart plugs. The remaining support cases were related to inquiries about other functionalities that were not yet operational or to report bugs and inconsistencies in the system.

KPI 8 At least "Good" is the overall score in the System Usability Scale (SUS) for all participants.

Table 40: UC-PT1-001 (Replicating UAVR) KPI 7

Parameter	Value
SUS Score participant 1	42.5
SUS Score participant 2	50
SUS Score participant 3	47.5
SUS Score participant 4	50
Average SUS Score over all participants	47.5

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The overall usability was poor, with an average score of 47.5 out of 100. While the eCare application worked very well, the integration with other technologies did not function optimally, resulting in self-reported usability issues by the participants. The items that scored 3 or less were:

- SUS – item 2: *I found this technology unnecessarily complex* - Participants found the level of complexity to be too high for activities such as connecting the smart plugs. There was also difficulty due to the need to install several different applications, sometimes with redundant information, which confused the participants. They all mentioned that there should be only one App, and everything else should be transparent to the user.
- SUS – item 5: *I found that the various functions in this technology were not well integrated* - This is because the integration between different digital solutions was not fully achieved, particularly with the air quality node and the gateway, and the communication between the Apps was not smooth. Also, participants did not understand the need for having two Apps with similar information and found it confusing.
- SUS – item 7: *I would imagine that most people would learn to use this technology very quickly* - Participants considered that the system was not robust enough to be offered to older individuals.
- SUS – item 8: *I found this technology very cumbersome (awkward) to use* - Participants found the technology cumbersome to use due to issues such as having multiple languages in the same interface or not displaying data (for example, usage data from the smart plugs).

However, some aspects of the technology were appreciated. Particularly, the fact that the main application brought together all the areas that belonged to the pilot, featuring large and representative icons. This was greatly valued by all the four participants. They also valued touch interaction, mentioning that the tablet was ideal for an App like the one presented.

Participants also said that the interface that aggregated all the applications was simple and easy to understand and should be the only application given to older adults, so that they have all the information available in a single application. Portuguese older adults have, in general, low digital literacy and, therefore, technology needs to be simple to use and interact with.

KPI 9 At least 50 % of the participants are willing to use the digital solutions after the pilot phase.

Table 41: UC-PT1-001 (Replicating UAVR) KPI 8

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Parameter	Value
Number of participants in total	4
Number of participants who are willing to use the digital solutions after the pilot phase.	2
Percentage	50%

Half of the participants mentioned that they would like to continue using this digital solution, while the other 2 stated that they would only like to use the Xiaomi Band 3 for physical activity monitoring. One participant said that the possibility of keeping track of the sleep hours and the steps taken enabled her ability to manage them and take appropriate actions to increase them.

All participants expressed interest in monitoring the air quality in their homes, but this information was not available in the application.

KPI 10 At least 50 % of the participants feel that it would be useful to develop a specific platform for healthy ageing.

Table 42: UC-PT1-001 (Replicating UAVR) KPI 9

Parameter	Value
Number of participants in total	4
Number of participants who feel that it would be useful to develop a specific platform for healthy ageing.	4
Percentage	100 %

It was unanimously agreed among all participants that a platform that brings together various services related to active aging for older people would be valuable as it would facilitate access to a range of technologies and services that would promote participation and active aging of older adults. However, in the view of participants, it is of paramount relevance that all services are aggregated into the same platform.

Overview of KPI achievement

Table 43: UC-PT1-001 (Replicating UAVR) Overview of KPI achievement

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Key performance indicator	Achieved during large-scale pilot activity (yes/no)	Comments
KPI 1	Yes	
KPI 2	Yes	
KPI 3	n.a.	Not relevant for replicating site
KPI 4	No	The questionnaires were not filled because, initially, they were not appearing in the application, and later they were in German, a language that none of the participants understood.
KPI 5	Yes	
KPI 6	Yes	
KPI 7	No	40% of all support cases were considered to be serious support cases.
KPI 8	No	The overall score on the System Usability Scale (SUS) was below the cut-off point for good usability.
KPI 9	Yes	
KPI 10	Yes	

Overall KPI from this UC001 **At least 70 % from all KPIs must be successful.**

Table 44: UC-PT1-001 (Replicating UAVR) Overall KPI

Parameter	Value

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Number of KPIs	9
Number of successful KPIs	6
Percentage	66,7%

Conclusion:

Six out of the 9 pre-defined KPIs were achieved in the replication of this use case at UAVR. The main KPI's that were not met are related to either aspect of the technology or to its functioning (questionnaires available in a language that the participants did not understand; malfunctioning of certain equipment), which greatly influenced the usability ratings given by participants.

Evaluation of MAST

The MAST framework, as already introduced in Chapter 2.4.2 *Planning of evaluation,* was used to evaluate the effectiveness and contribution of UC-PT1-001 to quality of care. The evaluated data/outcome are presented in Table 45.

Table 45: UC-PT1-001 (Replicating UAVR) Evaluation of MAST

MAST Domain	Topic	Outcome	Baseline (mean/SD)	End of pilot (mean/SD)	Change in mean
Clinical Effectiveness	Mental health	OSSS-3 (social support) and life events	M = 12.5 SD = 1 Med = 12 Min = 12 Max = 14	M = 11.4 SD = 1.2 Med = 12 Min =11 Max = 14	-1.1
	Effects on health-related quality of life	EQ-5D-5L scores	M = 5 SD = 0 Med = 5 Min = 5 Max = 5	M = 5 SD = 0 Med = 5 Min = 5 Max = 5	0.0
		WHOQOL-BREF scores	**Domain 1** M = 3.7 SD = 1.51 Med = 4 Min = 1 Max = 5	**Domain 1** M = 3.8 SD = 1.52 Med = 4 Min = 1 Max = 5	0.1
			Domain 2 M = 4.1	**Domain 2** M = 4.0	0.1

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			SD = 1.21 Med = 4 Min = 1 Max = 5	SD = 1.20 Med = 4 Min = 1 Max = 5	
			Domain 3 M = 5.0 SD = 0 Med = 5 Min = 5 Max = 5	**Domain 3** M = 5.0 SD = 0 Med = 5 Min = 5 Max = 5	0.0
			Domain 4 M = 4.4 SD = 0.7 Med = 4 Min = 3 Max = 5	**Domain 4** M = 4.4 SD = 0.6 Med = 4 Min = 3 Max = 5	0.0
Patient perspectives	Satisfaction and acceptance	User acceptance (TAM score)	/	**Ease of use:** M = 3.8 SD = 0.5 Med = 4 Min =3 Max = 4	/
				Future use: M = 3 SD = 1.2 Med = 3 Min = 2 Max = 4	/
				Usefulness: M = 3.25 SD = 1.0 Med = 3.5 Min = 2 Max = 4	/
	Understanding of information	Usability of application (SUS Scores)	/	M = 47.5 SD = 3.5 Med = 48.8 Min = 42.5 Max = 50	/
	Confidence (in the treatment)	Usability of application (1-item	M = 4.8 SD = 0.5 Med = 5 Min = 4 Max = 5	M = 4.8 SD = 0.5 Med = 5 Min = 4 Max = 5	0.0

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	Ability to use the application Access & Accessibility	health literacy)			
	Empowerment Self-efficacy	Self-efficacy (GSES)	M = 34.5 SD = 3.7 Med =33 Min =32 Max = 40	M = 34.3 SD = 2.5 Med =33 Min = 33 Max = 38	0.2
Economic aspects	Amount of resources used when delivering the application and comparators	Cost of devices (Cost as per device purchasing invoice)	• Tablet: 316,75 x 4 = 1267€ • Protective cover tablet: 8 x 4 = 32€ • MiBand: 27.18 x 4 = 108,72€ • Air quality node • Smart plugs • Gateway • LAN Cable		
		Cost of using digital solutions and SHAPES platform	• Electricity (charging the tablet) • Wi-Fi connection • Server Finot* • Server TREE* • Server MedSyn • Server eCare • Different applications • SHAPES platform itself • SHAPES Marketplace		
		Cost of staffing (Timesheets and costing data)	• Training the users – 1 hour per user – 18.75x4 = 75€ • Travel cost 60€ • Development updated version • Remote support via phone 5€ • Support in person 1 hour per user – 18.75x4 = 75€		
*Not available as they were customized solution and they aren't at a commercial stage as yet					

During the pilot timeframe, eCare collected a total of 38.063 measurements. The distribution can be seen in Annex 66.

Secondary outcomes

A summary of the participant's experiences and the overall feedback resulting from the final interviews conducted individually with each participant are presented in Table 46.

Table 46: UC-PT1-001 (Replicating UAVR) Results final interviews

Thematic	Quotations

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Technology Adoption and Barriers	"In general, I enjoyed using this technology, especially the wristband to track my daily physical activity. I felt like I made an effort to meet the goal, although I didn't always succeed." (P1) "The most challenging part for me was connecting the smart plugs to the Internet. Older adults wouldn't be able to do it, but if someone does it for them, then it's fine." (P1) "The gateway made noise, which was annoying. I ended up turning it off and connecting it in another room." (P4) "I found that the system had several inconsistencies. In my opinion, it should only be given to people when everything is already pre-connected." (P3) "In terms of layout, the interface looks very simple, clean, and pleasant. Regarding navigation, it was not intuitive to go back. For example, after viewing the steps graph, it wasn't clear to me how to return to the initial dashboard." (P1) "One of the things I liked the most about this system was the weekly and monthly graphs of the number of steps and hours of sleep." (P4) "On the tablet, I had five different applications, and I was always unsure which one to use." (P1)
User Experience and Ease of Use	"If all the devices had worked properly, my experience would have been much more enjoyable. The fact that there are interfaces in German, such as the profile and questionnaires, gives an unfinished appearance and undermines the credibility of the system." (P1) "I think all the items were very well chosen. It's excellent for the older adults to have a representative icon next to the text, such as using a bed icon for sleep or using an electricity plug icon for monitoring appliances."(P2)

	"I felt motivated to go for walks because I knew that with the smartwatch, I could later check those data in the application. " (P2) "I would like to give a fitness tracker wristband to my parents so that they are aware of how little they walk during the day." (P3)
Recommendations for Improvement	"To begin with, the entire system should be in the participants' native language, and there should be consistency across different menus. For example, in the weather or air quality monitoring section, the top bar is red, while in other menus, the interface is all in shades of green". (P4) "I missed consistency when it came to going back. In some menus, there was a back arrow (located in the upper left corner), while in others, there was a home symbol located in the upper right corner." (P3) "I was very curious to know the air quality in my home since I live near a road with heavy traffic, but unfortunately, that functionality is not yet working." (P2) "It would have been good if each person had been given a user manual describing all the functionalities and advantages of the system." (P2)

Recommendations for tech-partners during and after the pilot

The recommendations for the technology partners include:

- Ensure interoperability among all provided Apps.
- Ensure the translation to the user's native language of all content displayed in the interfaces.
- Integrate all technological solutions into a single App so that the user only interacts with one interface.
- Standardize the interface (using shades of white and green) and remove the red bar.
- Create mechanisms for easy installation of all Apps (in a single package).

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- Provide a user manual with descriptions of the technologies, frequently asked questions, troubleshooting guides, and instructions for resolving issues that might appear.

Ensure the functionality of all digital solutions.

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2.13 Phase 5: Large Scale Pilot Activity replicating site AIAS

Overview of replicating site:

Table 47: UC-PT1-001 Replicating site AIAS

Replicating site	
Name	AIAS Bologna onlus
Shortcut	AIAS Bologna
Location	Bologna
Participants involved in replicating of this UC (Number in total)	6
Participants in the role of a care receiver Number	4
Participants in the role of a caregiver Number	4
Participants in the role of a researcher Number	1
Duration of replicating (days)	7-10 days

2.13.1 Recruitment

Participants were recruited within the network of members and users of AIAS Bologna. AIAS recruited 4 persons as care receivers (a couple living together and two other men living independently with their wives) and 2 caregivers.

Inclusion criteria:

- person aged 65 years old or older at the time of recruitment
- living independently
- self-reported capacity to wear the activity wristband and use the apps installed on the tablet

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- self-reported capacity to consent

Exclusion criteria:

- Inability to give an autonomous informed consent.

Informed written consent was obtained in-person from all participants prior to the start of the pilot. Besides, all participants received a copy of the information sheet and a copy of the informed consent form. The original informed consent was then safely stored in a locked cupboard, that is only accessible for AIAS staff and in a specific folder in AIAS server.

2.13.2 Communication and dissemination of pilot activity

AIAS aims at disseminating the findings of the replicating pilots at conferences and other events related to health care technologies.

2.13.3 Risk management

The replication of this use case was challenged by the time constraint and the functionality of the technologies itself and as well the availability of the devices, so we needed to reduce the number of participants planned. Although the trial period was not as planned, we managed to involve users in all the activities foreseen in the protocol, test the technology and give feedback to the technological partners.

2.13.4 Outcome of large scale pilot activity

Overview

Due to a consistent delay for obtaining the devices, the replication pilots of the SHAPES UC-PT1-001 in AIAS Bologna, was conducted during the last two week of May with 6 participants, 4 care receivers and 2 caregivers.

- Socio-demographics of the participants

Table 48: UC-PT1-001 (Replicating AIAS) Sociodemographics of participants

Variables	Number of participants	Value
Age (years)	care receiver = 4 caregiver = 2	Average age care receiver = 68 Average age caregiver =
Male	Male =3	Male: 75 %

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Female	Female =1	Female: 25 %
Technological skills:		Advanced user: Beginners:
Country:	Italy	100 %
Marital status: Married: Widowed: Other?	Married=4	100%
Occupational status: Retired Employed full time: Other?	Employed full time: 2 Retired: 2	Employed full time: 50% Retired: 50%
Residence: What kind?	Own Home=4	100%

Primary and secondary outcome

Primary outcome

The primary outcomes were to measure a predefined set of KPIs which have already been presented in chapter 2.5.2 as well as to evaluate the UC-PT1-001 use case using the MAST evaluation tool.

The following tables present the data used to determine the success of each KPI. **Error! Reference source not found.** provides an overview of the success of the pilot with regards to KPIs.

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Overview about KPIs (CCS piloting):

Table 49: UC-PT1-001 (Replicating AIAS) KPI Overview

	school grading system / grade 3 should always be achieved = KPI (min.)									
PT1-UC001 KPI for phase 5		1 = excellent complies with		2 = good complies with		3 = sufficient complies with		4 = poor complies with		5 = insufficient complies with
KPI 1: successful participant recruitment (target 10 participants)	1	10	2	9-8	3	7-6	4	5-4	5	< 4
KPI 2: How many recruited participants remained enrolled in the pilot until the end of phase 5?	1	10	2	9-8	3	7-6	4	5-4	5	< 4
KPI 3: How many % of the offered 14-day questionnaires were fully completed (WHOQOL-OLD)?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 4: How many % of the offered daily questionnaires were answered?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 5: How many % of participants wearing the smartwatch during 60 % of the days?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 6: How many % of participants wearing the smartwatch during 60% of the night?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 7: How many % of all support cases during the test phase are serious cases? What are serious support cases? - System crash, user cannot log in, system does not collect data, support from/with TecPartners necessary, …	1	5%	2	>5%-10%	3	>10%-15 %	4	>15%-20%	5	>20%
KPI 8: SUS Score (System Usability Scale)	1	Best Imaginable (100%)	2	Excellent (>80 %)	3	Good (80-60%)	4	Poor (<60%)	5	Worst Imaginable (<15%)
KPI 9 How many % of the participants are willing to use the digital solutions after the test phase?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 10: In general, how many % of the participants feel that it would be useful to develop a specific platform for healthy ageing?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
Summary						At least 70% of the KPIs must be met for the UC to be successful.				

KPI 1 At least 60% of the target cohort were successfully recruited into the pilot during the recruitment period.

Table 50: UC-PT1-001 (Replicating AIAS) KPI 1

Parameter	Value
Target number of participants	5-10
Number of participants recruited	4
Percentage recruited	80%

Because of the availability of the devices we had to reduce the number of participants

KPI 2 At least 60% of recruited participants remained enrolled in the pilot until the end of the pilot.

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Table 51: UC-PT1-001 (Replicating AIAS) KPI 2

Parameter	Value
Number of participants at baseline	4
Number of dropouts	0
Number of participants at the end of the pilot	4
Percentage retained	0%

KPI 3 not relevant for replicating site

The Tec Partner did not offer or provide the module for replication.

KPI 4 At least 50% of the offered daily questionnaires were answered by the participants.

Table 52: UC-PT1-001 (Replicating AIAS) KPI 3

Parameter	Value
Number of offered daily questionnaires.	NA
Number of answered daily questionnaires	NA
Percentage of answered daily questionnaires	NA

KPI 5: At least 50% of the participants wearing the smart watch during 60% of the days during the pilot.

Table 53: UC-PT1-001 (Replicating AIAS) KPI 4

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Parameter	Value
Number of days during the pilot (in total)	16
60 % of total days	6
Number of participants during pilot	4
Number of participants wearing the smart watch on 60% of total days	4
Percentage of participants wearing the smart watch during 60% of the days during the pilot.	100%

KPI 6: At least 50% of the participants wearing the smart watch during 60% of the nights during the pilot.

Table 54: UC-PT1-001 (Replicating AIAS) KPI 5

Parameter	Value
Number of nights during the pilot (in total)	16
60 % of total nights	6
Number of participants during pilot	4
Number of participants wearing the smart watch on 60% of total nights	4
Percentage of participants wearing the smart watch during 60% of the nights during the pilot.	100%

KPI 7: A maximum of 15% of all support cases can be serious support cases.

Table 55: UC-PT1-001 (Replicating AIAS) KPI 6

Parameter	Value

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Number all support cases.	4
Number of serious support cases.	0
Percentage of serious support cases.	0%

KPI 8 At least "Good" is the overall score in the System Usability Scale (SUS) about all participants.

Table 56: UC-PT1-001 (Replicating AIAS) KPI 7

Parameter	Value
SUS Score participant 1	Good
SUS Score participant 2	Good
SUS Score participant 3	Good
SUS Score participant XY	Good
Average SUS Score over all participants	78.1

KPI 9 At least 50 % of the participants are willing to use the digital solutions after the pilot phase.

Table 57: UC-PT1-001 (Replicating AIAS) KPI 8

Parameter	Value
Number of participants in total	4
Number of participants who are willing to use the digital solutions after the pilot phase.	4
Percentage	100%

KPI 10 At least 50 % of the participants feel that it would be useful to develop a specific platform for healthy ageing.

Table 58: UC-PT1-001 (Replicating AIAS) KPI 9

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Parameter	Value
Number of participants in total	4
Number of participants who feel that it would be useful to develop a specific platform for healthy ageing.	4
Percentage	100%

Overview of KPI achievement

Table 59: UC-PT1-001 (Replicating AIAS) Overview KPI achievement

Key performance indicator	Achieved during large-scale pilot activity (yes/no)	Comments
KPI 1	Yes	
KPI 2	Yes	
KPI 3	NA	Not relevant
KPI 4	NA	
KPI 5	Yes	
KPI 6	Yes	
KPI 7	Yes	
KPI 8	Yes	
KPI 9	Yes	
KPI 10	Yes	

Overall KPI from this UC001 At least 70 % from all KPIs must be successful.

Table 60: UC-PT1-001 (Replicating AIAS) KPIs overall

Parameter	Value

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Number of KPIs	8
Number of successful KPIs	8
Percentage	100%

Conclusion:

Despite technical challenges and difficulties, KPIs were successfully reached, and replication was successfully carried out. If the testing time would have been longer, results and assessments could have been more accurate and informative.

Unfortunately, the survey tool could not be offered by the technical partner or did not work during the entire test phase.

Evaluation of MAST

The MAST framework as already introduced in chapter *2.4.2 Planning of evaluation* was used to evaluate the effectiveness and contribution of UC-PT1-001 to quality of care. The evaluated data/outcome are presented in the Table 61 below:

Table 61: UC-PT1-001 (Replicating AIAS) Evaluation of MAST

MAST Domain	Topic	Outcome	Baseline (mean/SD)	End of pilot (mean/SD)	Chang in mean (SD)
Clinical Effectiveness	Mental health	OSSS-3 (social support) and life events	M = 8,8 SD = 1,5 Med = 9 Min = 7 Max = 7 **“POOR/MODERATE”**	M = 8,0 SD = 1,4 Med = 7,5 Min = 7 Max = 10 **“POOR/MODERATE”**	0,8 (0,1)
	Effects on health-related quality of life	EQ-5D-5L scores (VAS)	**Health Status** M = 73,75 SD = 9,5 Med = 77,5 Min = 60 Max = 80	**Health Status** M = 70 SD = 14 Med = 70 Min = 60 Max = 80	3,75 (-4,5)
		WHOQOL-BREF scores	**Domain 1** M = 21,25 SD = 1,7 Med = 21,5	**Domain 1** M = 26 SD = 4,4 Med = 28	-4,75 (-2,7)

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			Min = 19 Max = 23	Min = 21 Max = 29	
			Domain 2 M = 21,75 SD = 3,7 Med = 22 Min = 17 Max = 26	**Domain 2** M = 22,3 SD = 1,2 Med = 23 Min = 21 Max = 23	-0,55 (2,5)
			Domain 3 M = 11 SD = 1,2 Med = 11 Min = 10 Max = 12	**Domain 3** M = 11,3 SD = 1,2 Med = 12 Min = 10 Max = 12	-0,3 (0)
			Domain 4 M = 28 SD = 0,8 Med = 28 Min = 27 Max = 29	**Domain 4** M = 29,7 SD = 3,5 Med = 30 Min = 26 Max = 33	-1,7 (2,7)
Patient perspectives	Satisfaction and acceptance	User acceptance (TAM score)	/	**Ease of use:** M = NA SD = NA Med =NA Min =NA Max = NA	
				Future use: M = 3,25 SD = 0.96 Med = 3.5 Min = 2 Max = 4	
				Usefulness: M = 3 SD =0,8 Med = 3 Min = 2 Max = 4	
	Understanding of information	Usability of application (SUS Scores)	/	M = 78,1 SD = 5,2 Med = 78,75 Min = 47,5 Max = 100	

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	Confidence (in the treatment) Ability to use the application Access & Accessibility	Usability of application (1-item health literacy)	M = 4 SD = 0 Med = 4 Min = 4 Max = 4	M = 4,25 SD = 0,5 Med = 4 Min = 4 Max = 5	-0.25 (-0.5)
	Empowerment Self-efficacy	Self-efficacy (GSES)	M = 35,8 SD = 4,4 Med =36 Min =27 Max = 39	M = 39,25 SD =5 Med = 38 Min = 11 Max = 40	-0,75 (-0,6)
Economic aspects	Amount of resources used when delivering the application and comparators	Cost of devices (Cost as per device purchasing invoice)	• Tablet: 289,00 € (Mean) • Protective cover tablet: 20.99 € (Mean) • MiBand: 28,89 € (Mean) • Air quality node*: • Smart plugs*: • Gateway*: • LAN Cable*:		
		Cost of using digital solutions and SHAPES platform	• Electricity (charging the tablet) • Wi-Fi connection: • Server Finot* • Server TREE* • Server MedSyn • Server eCare • Different applications: • SHAPES platform itself: • SHAPES Marketplace:		
		Cost of staffing (Timesheets and	• Training the users • Travel cost • Development updated version • Remote support via phone		

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		costing data)	• Support in person
*Not available as they were customized solution, and they aren't at a commercial stage as yet			

During the pilot timeframe, eCare collected a total of 22.232 measurements. The distribution can be seen in Annex 67.

Secondary outcomes

Perception and understanding

There weren't particular difficulties in operating the individual application and the participants found the layout easy to use, however they didn't think it is particularly attractive or engaging. The smart-band and the monitoring of health parameters were the most appreciated elements.

They had difficulties in using some of the features of the use cases because there were many technical issues still unsolved (i.e. an App still not translated and/or not functioning properly)

A strong disconnection between the watch and the App was highlighted. Having the possibility to visualize all the things the watch detects into the App (i.e. exercises, sport activities) is desirable as well as the monitoring of blood pressure.

Interaction / Intuition / Function

Participants that are used to work and use smartphones and PC every day it was easy to handle the Apps while a participant with lower knowledge of ICT find it more difficult.

Because of some of the functionalities were not functioning properly, some difficulties were reported in finding the data collected and the usefulness of the use case was perceived limited. One of the participants highlighted that a function that give reminders and feedback could stimulate to use the App and improve the lifestyle.

Appearance / Layout

The layout was found quite immediate and clear, with large characters and good contrast.

General feedback

Participants thinks that a technological system that help people to monitor their health status and wellbeing is in general useful, also to prevent illness.

They liked very much the smart band because they found the link with the App, it is practical and have a clear purpose. They stated that the App was easy to use, and they need just an initial explanation to use it fruitfully.

They are likely willing to continue to test the App, but they would like to see implementation of the functionalities. Further all the participants affirmed that they won't be willing to pay for the App or at least a very low price.

They recognise the value of the App for people who have pathologies that implies the monitor of parameters: in this case, there should be some professionals and/or caregivers that monitor the data collected.

The use of the App could also be useful to keep older people active and stem the strong degenerations of old age by staying active as much as possible. The use of solutions could become a fixed task at a specific time of the older person's day so that it becomes a habit.

Recommendations for technical-partners during and after the pilot

- Improve the functionalities and the connection of the various App in order to have a complete overview of all the parameters.
- It would be useful if the App showed the battery percentage of the connected devices (smart band) and whether or not they are connected to the App so that users can easily know whether everything is working or not.
- Add other data (i.e. sport activities).
- Translate the applications.
- Create a prototype that is as advanced as possible with regard to the idea of the final product (e.g. integrating all the Apps into one front-end interface or using a consistent interface so that these "non-final" elements do not drive the testers' opinion negatively with regard to the system in general).
- Adding explanatory elements to the various Apps regarding their use (also useful could be to integrate information for users on how to use them).
- Provide accessibility customizations (e.g. text size, contrast and so on).
- Add more reward messages when using the system correctly or frequently.

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3 Use case 002

3.1 Introduction

This chapter describes the pilot activities of UC-PT1-002 Digital Assistant to support older people to live independently and remain socially connected. Target persons of this use case were aged 65 and older, living independently or with sporadic supervision in rural or urban areas of Saxony, Germany. The SHAPES Persona for this pilot theme is ‘Ernst’:

Ernst is 75 years old, a recently retired former teacher from a college. He lives with his wife Alberta in a small town in Bavaria in their family home with a garden. Ernst is in very good health. He exercises every day for 30 minutes in the morning. His digital literacy and affinity to technology is high. He wants to stay in good health, keep his hobbies and have regular contact to his grandchildren. Furthermore, he is sometimes worried about Alberta, who suffered a stroke 5 years ago. She recovered very well but has to attend regular doctor appointments. Ernst thinks he could perhaps benefit from better information about the after-stroke complications and recommended prevention to better support his wife.

Objectives

Within this use case, a virtual assistant was created, which can be applied to smart speakers, robots or tablets. One of the objectives is to assist the participants with a defined set of skills, for instance the agenda, reminder or how-to skills. The main objective of the use case is to evaluate the user engagement and self-perceived usefulness of a digital solution addressed to assist older people in keeping active, including the promotion of social activities. This shall enable the development of a set of guidelines for future work and research.

Carus Consilium Sachsen GmbH (CCS) is the use case leader. Replicating sites are AIAS, CH and SAL.

3.2 Description

This use case addresses older people living independently in rural or urban environments. They usually live alone or with their wife/husband and are regularly visited or supervised by a family member or caregiver.

In order to remain independent, they often need help to remember appointments or to perform basic tasks such as cooking, taking medication, using household appliances, etc. Another important issue is that they are at risk of isolation and communication and social engagement need to be reinforced/maintained. All this can be promoted by using a digital assistant to help the older persons with daily tasks. The digital assistant offers to the seniors:

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- How-to – how to perform daily tasks
- Questionnaires – perform follow-up questionnaires that are filled through the digital assistant
- Agenda – set up personalized calendar events for the user, like drug intakes, birthdays, doctor appointments, or other custom events.
- Reminders – trigger a reminder for a user about some event/item corresponding to the previously described skills (e.g. set a reminder that a certain user has to take a pill at a certain time or to fill in a pending questionnaire)

3.3 Digital solutions used in this use case

Safe Digital Assistant – Nari

The smart and safe digital assistant using Automatic Speech Recognition (ASR) and Natural Language Processing (NLP) technologies provides timely reminders, instructions and communication suggestions. It can be controlled by voice or text. The digital assistant is a function on the tablet within a web browser, requiring a loudspeaker for the interaction via voice control.

Wake-up word: (VICOM)

The wake-up is a module which can identify a specific word sound to activate listening for speech recognition. It is necessary for a constant readiness to listen to the user without a high-power consumption and maintain user privacy. To start a conversation, users have to say “Hey Nari”.

There are two types of front ends – one for the older person (to access the assistant) and one for the care giver (to create and plan interaction contents).

Caregiver administration panel: (VICOM)

The caregiver or a closer relative is responsible for organising the agenda for the older user and the digital assistant is triggered accordingly. The care givers need to learn how to use the Adilib skills user interface. This includes setting reminders that Nari gives the user and setting the agenda events, questionnaires and the required information to be consumed by their cared ones.

Adilib Chatbot: (VICOM)

The daily interaction between the digital assistant and the senior may involve a dialogue with the user to retrieve him/her acknowledgement or to guide him/her through the actions to take. Furthermore, they have to answer a satisfaction assessment with regards to the digital assistant.

Voice Layer: (VICOM)

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To improve the daily interaction by making it more intuitive a speech-based dialog is necessary. The users are able to pose questions or issue orders which speed up the communication and makes the use of the digital assistant more useful for older persons.

3.3.1 Digital solutions used for COVID-19 response

The use case itself provides support in the daily lives of older people and remain them socially connected. This is an advantage in the event of a pandemic.

Special COVID-19 digital solutions are not included.

3.3.2 Equipment and devices used (from third parties)

The following additional hardware and software external devices were used in UC-PT1-002:

- Android Tablet (Samsung Galaxy S6 Lite)
- Loudspeaker (Jabra SPEAK 510+ UC)

3.4 Data plan

The data plan for UC002 is shown in Table 62 below. The original can be found in Annex 22.

Table 62: UC-PT1-002 Data Plan

Outcome
General data (i.e. data related with all pilot goals/covariates)
Caregiver data
Caregiver age
Caregiver highest educational degree
Caregiver spatial distance to care receiver
Internet-related variables with regard to care receiver
Access to device with internet connection at least twice a week (inclusion criteria; Yes/No)
Skilled to use internet (inclusion criteria assessed by referral of participants; Yes/No)
Frequency of internet use
Caregiving-related data
Type of care provided (Formal vs. informal)
Duration of care provision (in years)
Frequency of care provision (number of hours per week)

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Existence of other care providers (Yes/No)
Relationship with the care receiver
Cohabitation with the care receiver (Yes/No)
Care receiver data
Care receiver age
Care receiver gender
Degree of dependence (subjectively evaluated by the informal caregiver)
Individual top three challenges
Use Case 2 (Digital Assistance / NLP)
Number of interactions with digital assistant

3.4.1 Data capture methods to be used

A range of different data capture methods were used during the five phases of this pilot. More details can be found under the sections describing Phases 1 to 5.

3.4.2 Planning of evaluation

MAST

The MAST framework was used to evaluate the effectiveness and contribution of UC-UC-PT1-002 to quality of care. MAST is described as a multidisciplinary process that summarises and evaluates information about the medical, social, economic and ethical issues related to the use of telemedicine.

A review of the seven dimensions of MAST revealed that three of the seven multidisciplinary dimensions/domains were of specific relevance to the pilot of UC-PT1-002. These were: Clinical Effectiveness; Patient Perspectives; and Economic Aspects. Table 63 contains the data required for the MAST evaluation.

Table 63: UC-PT1-002 MAST

MAST Domain	Topic	Outcome	Data required	Time point
Clinical Effectiveness	Mental health	OSSS-3 (social support) and life events		
	Effects on health-related quality of life	Health-related quality of life	EQ-5D-5L scores	Baseline and end of pilot

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Patient perspectives	Satisfaction and acceptance	User Experience	TAM score	End of pilot
	Understanding of information Confidence (in the treatment) Ability to use the application Access	Usability of application	SUS Scores	End of pilot
	Empowerment Self-efficacy	Self-efficacy	General self-efficacy scale	Baseline and end of pilot
Economic aspects	Amount and cost of resources used	Cost of devices	Cost as per medical device purchasing invoice	End of pilot
		Cost of using digital solutions and SHAPES platform	Costs to be provided by SHAPES	End of pilot
		Cost of staffing	Timesheets and costing data	End of pilot

MAFEIP

Due to the evaluation methodology (small-scale deployment, non-case controlled) the MAFEIP tool was not used to evaluate UC-PT1-002.

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3.4.2.1 Final check of the use case by using the CSFs of MOMENTUM and the NASSS framework

MOMENTUM

The MOMENTUM blueprint was applied to check if UC-PT1-002 had the critical success factors (CSFs) needed to take it from the pilot phase to large-scale deployment (Annex 23). Details of each CSF are provided below.

CSF 1. Cultural readiness for the telemedicine service

According to interviews in mock-ups the participants are willing to share behavioural and medical data with them. Patients usually accept new technologies as far as they have a clear benefit.

The participants already use digital solutions in their daily life and often show a medium to high digital literacy. Even participants with less digital knowledge are aware of the potential benefits that digital solutions can offer.

In the region where this use case is deployed, only limited sharing of clinical information between different health care providers is realized. Within one institution information are shared with the patient. Progress and promoting of telemedicine is highly welcomed in the region.

CSF 2. Advantages of telemedicine in meeting compelling need(s)

In order to reduce loneliness and improve the autonomous lifestyle of older people tools that support the users are needed. Tools like the digital assistant Nari provides a set of skills, for instance, the agenda, reminder or how-to skills, to assist the seniors in daily tasks.

With the help of SHAPES digital solutions a set of recommendations are made, and normality patterns are inferred. Once anomalies or risky situations are detected, an alarm is triggered to the corresponding caregiver so that appropriate intervention is carried out.

CSF 3. Ensure leadership through a champion.

Several professionals with experience in speech and natural language technologies participated in the development process of the digital assistant.

CSF 4. Involvement of health care professionals and decision-makers

The deployment of this use case does not foresee any participation of health care professionals and thus they have not been involved in the development. As the organisation of this use case is working together with decision makers from the reference site, those have been involved in the process of the project.

CSF 5. Put the patient at the centre of the service

The participants have been involved in mock-up presentations in phase 2 and hands-on training in phase 3.

The objectives of the use case are to promote social activity and active healthy ageing. Studies show that seniors who stay socially active and engaged experience a variety of benefits, both in physical and psychological health.

Due to the cooperation with the participants and getting their feedback, it is possible to further develop the digital solutions and adjust them to the individual needs of the older people.

CSF 6. Ensure that the technology is user-friendly

It is the objective and great effort is made within the SHAPES consortium to define requirements to present the technologies of UC002 as user friendly as possible to older persons. The visual design but also the operation of the digital solutions are adapted to the needs of the older people. The handling should be as intuitive as possible. Half-day training is expected to be sufficient.

CSF 7. Pull together the resources needed for deployment

The resources required for deployment of the digital solutions for the pilot are available thanks to SHAPES funding and internal resources already allocated. The technical partners of the use case provide all IT competences.

CSF 8. Address the needs of the primary client(s)

Older people/families are potential clients. The solution is used as a tool (for caregivers) to promote social activity. It can enhance the security feeling of the care-receiver, as well as for the caregiver.

Healthcare providers are potential customers. The ability to care for individual seniors may allow for more individualized therapy and faster therapy changes, once a decrease in any physical concern is detected.

CSF 9. Prepare and implement a business plan

A business plan for the solution was developed in D7.3 SHAPES Business Plan WP7.

CSF 10. Prepare and implement a change management plan

It will be evaluated after the end of the project.

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CSF 11. Assess the conditions under which the service is legal

Completing a Data Protection Impact Assessment (DPIA) identified and minimized any risks associated with the pilot with input sought from other WP and the SHAPES Data Protection Officer at CCS. Data processing agreements were established with relevant partners to permit access to pseudonymized data.

CSF 12. Guarantee that the technology has the potential for scale-up

Although the participants in the pilot are limited, the solution is being designed with the intention to scale it to a pan-European level**.**

CSF 13. Identify and apply relevant legal and security guidelines

GDPR has been applied. The system provided implements all security and privacy related regulations.

CSF 14. Involve legal and security experts

We are working with SHAPES partners (e.g. with LAUREA, with extensive expertise in this field). VICOM was awarded the ISO 27001 certification for information security management. HMU and VICOM have extensive expertise in IT infrastructure security.

CSF 15. Ensure that telemedicine doers and users are privacy aware

The CCS employees already work with data protection protocols. They were also instructed the application of data protection with the new technologies introduced in the pilot. Older people and informal caregivers were informed about data collection and process and consent was collected.

CSF 16. Ensure that the information technology infrastructure and eHealth infrastructure are available

SHAPES is developing a technology platform for pan-European distribution of telemedicine services. The pilot is being designed to be in no need to cope with this requirement.

CSF 17. Put in place the technology and processes needed to monitor the service

A system to monitor the pilot has been set up with support from WP4 and WP5 partners. Local IT and community support are also available to help address minor issues with the use of the digital solutions. Depending on local COVID-19 social distancing measures, support may need to be provided remotely. A system to monitor and mitigate incidences was established. It is impossible to predict any incident that may occur in a research project. It is more appropriate to assess the relative risks of certain incidences and have an appropriate plan in place for mitigating and managing

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incidents. The local research project team and community support officers were available to support participants in resolving any doubts they might experience with the digital solutions.

CSF 18. Establish and maintain good procurement processes

The requirements we need from the devices that was used in the pilot have been already defined and vendors that fulfil them have been identified. The SHAPES project provides the servers that are needed to run the solution. Those servers meet the service level needed to run the pilot successfully.

NASSS

The NASSS framework was used to detect areas of complexity in the project plan for piloting UC002 and, if needed, to make adaptations to the plan. The short version of the NASSS-CAT questionnaire was considered and completed by the pilot team (see Annex 4). At the time the NASSS framework was applied, of the seven domains, there were two domains (‘Technology’, ‘Intended adopters’ and ‘value proposition’) in which significant complexities were identified that, if not mitigated or addressed, were likely to affect the project’s success at the piloting stage of the use case.

Complexities were identified in other domains, however, these were related to a larger scale implementation and deployment of the use case into practice and so were not considered to be relevant at this stage of the project. They provide a useful basis for further exploratory research. Table 64 shows an overview of the results.

Table 64: UC-PT1-002 Complexities and mitigation measures identified using the NASSS framework

NASSS complexity domain	Uncertainties detected	Mitigation measures taken
Technology	Digital assistant hardly understands voice navigation.	
Technology	Digital assistant was not available in German (text and speech). Translations were made manually, that may lead to a higher error rate.	NLP for German language was bought by coordinator from external provider.

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Technology	Many interdependencies were developed. Bugs and crashes are expected.	Constant check and support contact person is needed to keep developing times.
Value proposition	For the optimal use the caregiver has to enter the information manually via the caregiver dashboard, which is very time-consuming.	
Value proposition	Positive effects are difficult to measure. There is no opportunity to follow the interaction of the user with the digital assistant. The caregiver only receives alerts if anomalies / no reaction from the care receiver is detected.	User experience evaluation with the aim to capture how well the technology is accepted by participants and caregivers
Intended adopters	Level of digital literacy in the intended patient participant population.	User experience evaluation with the aim to capture how well the technology is accepted by participants.

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3.5 Phase 1

The first phase of the pilot campaign intents the development of a realistic scenario for each use case. These scenarios are based on the People-Activities-Context-Technology (PACT) framework and Function and events, Interactions and usability issues, Content and Structure, Style and aesthetics approach (FICS).

3.5.1 PACT and FICS Scenario

PACT Scenario

Table 65: UC-PT1-002 PACT

Code	**UC-PT1-002** Version **0.2** Date **2022/01/04**
Applicable SHAPES Persona	Ernst (P1), Roberto (P2), Ayesha (P3), Isabelle and Marco (P4, especially needs of care giver), Helena (P7)
Applicable SHAPES use case	UC-PT1-002 Digital Assistant to Support Older People to Live Independently and Remain Socially Connected
Point of contact (pilot site)	Carus Consilium Sachsen GmbH (CCS)
Point of contact (technical provider)	Vicomtech (VICOM)
People Roles and/or actors of typical users involved in delivering and receiving the telemedicine intervention	• Older people, 65+ years, care recipient, living independently in their own home in rural or urban environments. They usually live alone or with their spouse and are visited or supervised by a family member or caregiver on a regular basis. They will have non to average level e-literacy and in some cases access to smart phone, laptop or PC. • Care giver: most likely relative(s), will have an average to high level of e-literacy and access to a smart phone, laptop or PC.
Activities Activities to be performed by the actors in order to successfully provide and receive the telemedicine intervention	**Older people / care receiver** • Interact with digital assistant on a daily basis • Answer satisfaction survey for direct satisfaction assessment with regards to digital assistant • Set reminders that the digital assistant will provide **Care giver** • Learn how to use the Adilib Skills user interfaces.

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procedures for the professional and the patient; Parameters that determine the measures used in the intervention	• Set reminders that the digital assistant will give the older people. • Set the agenda events, questionnaires and the required information to be consumed by their cared ones.
Context Social-medical relevance of the telemedicine intervention; privacy issues; risks for the patient; locations	• Digital assistant will be installed in older people´s own homes to assist daily living activities. • One of the key goals is to enable independence of older people. Often, they need assistance to remember appointments or to make/solve certain basic situation such as cooking, taking the medication, using home devices, etc. Another important issue is that they are at risk of isolation, and communication and social engagement must be reinforced/sustained. • Maintaining privacy of data is of the utmost importance. An identification list (including name and date of birth) will be held at the local pilot site. • GDPR and ethics in line with WP8 • Data and servers must be located within the EU • German language • Location: Saxony, Germany
Scenario:	Older person: Ernst is 75 years old, a recently retired former teacher from a college. He lives with his wife Alberta in a small town in their family home with a garden. Ernst loves to sing in the church choir and regularly does volunteer work for the local church charity. He and Alberta go once weekly to an older adults dancing club. They also love travelling – every year they go on a foreign holiday. Ernst is very good health. He exercises every day for 30 minutes in the morning. He likes to try new types of exercises according to his actual problems (usually slight knee pain or back pain) and often takes long walks. Ernst sometimes worries about Alberta, who suffered a stroke 5 years ago and although she recovered very well, she has to go to regular medical check-ups every 6 months, and he is always worried about the results. Together they enjoy doing the cognitive training exercises from the bool Alberta got from her doctor.

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	Ernst usually wakes up at 7.00h in the morning. Should he ever oversleep, the digital assistant called "Nari" will wake him up. Nari is the digital assistant of the SHAPES platform. Ernst and Alberta have been using it for some time, mainly for reminders and how-tos / instructions. In the morning, Ernst first goes to the bathroom and then prepares breakfast for himself and his wife. 9:00 a.m. Nari asks the seniors if they have already taken their medication and reminds them both of their appointment at the dance club this afternoon. Ernst spends the morning in the garden, pruning the trees now that autumn is here. He is unsure how to prune the small cherry tree. He goes into the house and asks Nari about it. Nari gives him step-by-step instructions so that Ernst can do it exactly. Alberta also needs instructions from Nari. She would like to cook a pumpkin soup. Nari navigates her step by step through the recipe so that Alberta can do all the necessary steps in parallel. After lunch, they both lie down for a little nap. 2 pm Nari reminds them again about their dance class, which already starts at 4 pm. After both are back in the evening, Nari reminds them of their medication. 21:30 Nari wishes both seniors a good night. Caregiver / relatives: Ernst and Alberta's sons feed the digital assistant with information on a monthly basis. They enter reminders or check the ones they already have. This is another security for themselves but also for their parents. Through the fulfilment of the reminder event, they always know whether their parents have taken their medication, for example.

Technology
 	
Type of information / parameter that are relevant in monitoring the health status; type and frequency of accessibility of information; feedback modalities (communication***)***
	Older people / care receiver
	• Age (year not DOB)
	• Gender (m/f)
	• Degree of dependence
	• Individual top three daily / common challenges
	• Internet-related variables
	    ○ Access to device with internet connection at least twice a week (inclusion criteria; Yes/No)
	    ○ Skilled to use internet (inclusion criteria assessed by referral of participants; Yes/No)

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	o Frequency of internet use **Care giver** • Age • Highest educational degree • Spatial distance to care receiver **Caregiving-related data** • Type of care provided (Formal vs. informal) • Duration of care provision (in years) • Frequency of care provision (number of hours per week) • Existence of other care providers (Yes/No) • Relationship with the care receiver • Cohabitation with the care receiver (Yes/No) **Digital assistant** • Number of interactions with digital assistant • Time / duration of interactions with digital assistant • Momentary state of satisfaction with interaction

FICS Scenario

Table 66: UC-PT1-002 FICS

Function and events ***Functionality of the intended system which is capable to realize actor's activities***	The digital assistant will offer to the older people: • How-to – how to perform daily tasks • Questionnaires – perform follow-up questionnaires that are filled through the digital assistant • Agenda – set up personalised calendar events for the user, like drug intakes, birthdays, doctor appointments, or other custom events. • Reminders – trigger a reminder for a user about some event/item corresponding to the previously described skills (e.g. set a reminder that a certain user has to a pill at a certain time or to fill in a pending questionnaire) In addition, the digital assistant will provide mechanisms to set reminders that the digital assistant will give to the older people.

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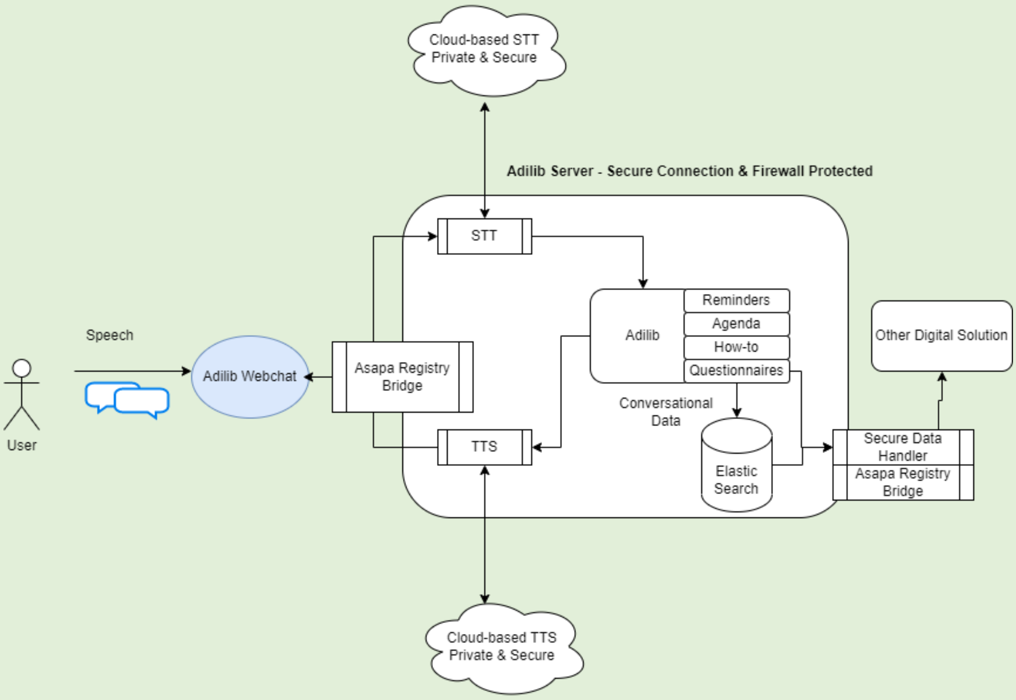
Interactions and usability issues ***User-system or system-component interactions meditating actor's activities; Types of the interactions, e.g. unidirectional data streaming service or reliable messaging service***	In this use case, we expect to have two users: - Older person - Care giver – most likely relatives There will be two types of front ends – one for the older person (to access the assistant) and one for the care giver (to create and plan interaction contents). Both can set reminders if they are registered in the Adilib skill interface with the required roles. Nevertheless, the skill logic is tied to the complementarity of caregiver/care-receiver profiles. Reminders can only be set through the Skill's user interface. The care giver can add to that set "How-tos", "Agenda events" and questionnaires. The digital assistant provides them to the care receiver. The wake-up word for the digital assistant is "Hey Nari". The care receiver activates the digital assistant with this wake-up word. The digital assistant can be controlled by text and speech.
Content and structure ***Variables of the interaction***	The digital assistant is an application within the SHAPES platform on an Android tablet. The care receiver and the care giver will need an android tablet with a web browser to use the digital assistant. Additionally, they will use an extra speaker/microphone. 

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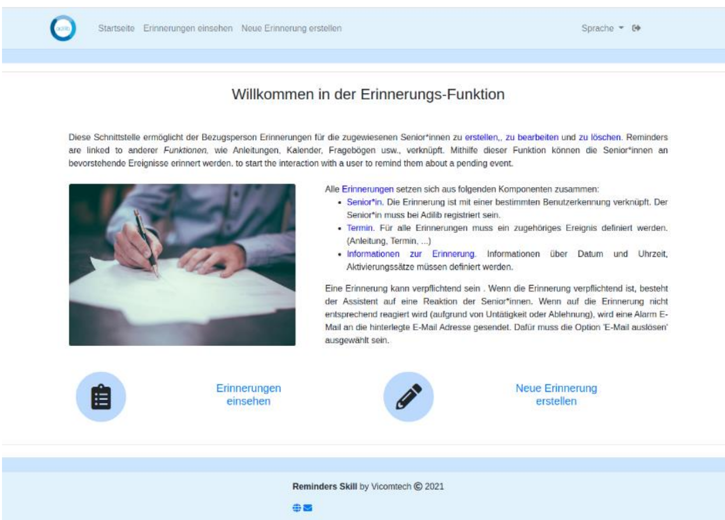
<table>
<tr><td></td><td></td></tr>
<tr>
<td>Style and aesthetics

Look and feel of the system</td>
<td>The technological solution supporting the use case adopted a "look and feel" inspired in the SHAPES project identity, namely its logo, colours and the use of photos. As a result, the digital solutions present the SHAPES logo. They use the national language of the use case pilot participants. Following the SHAPES UX guidelines (Deliverable D5.1), the digital solutions present a simple and straightforward language and a friendly, easy-to-use navigation scheme. The following images exemplify the style and aesthetics of the digital assistant supporting the use case.



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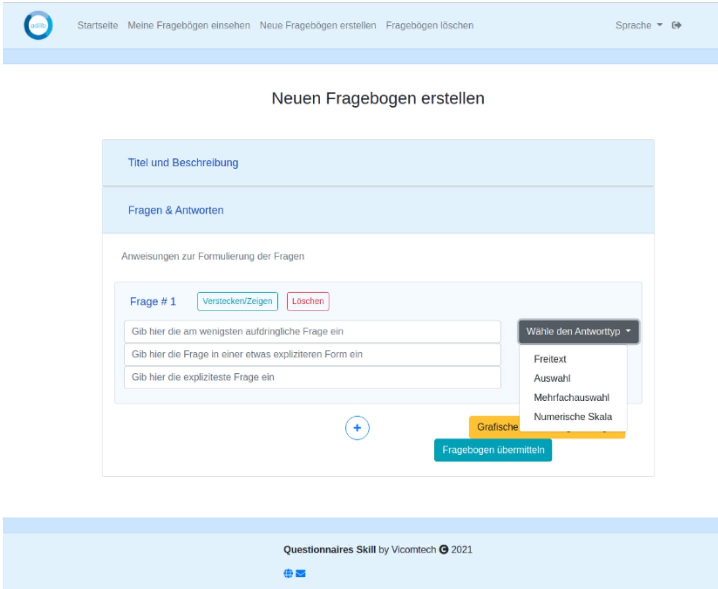

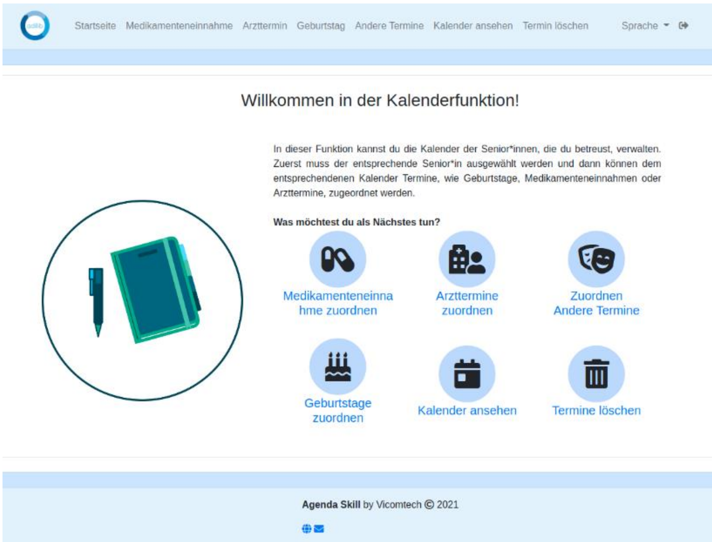

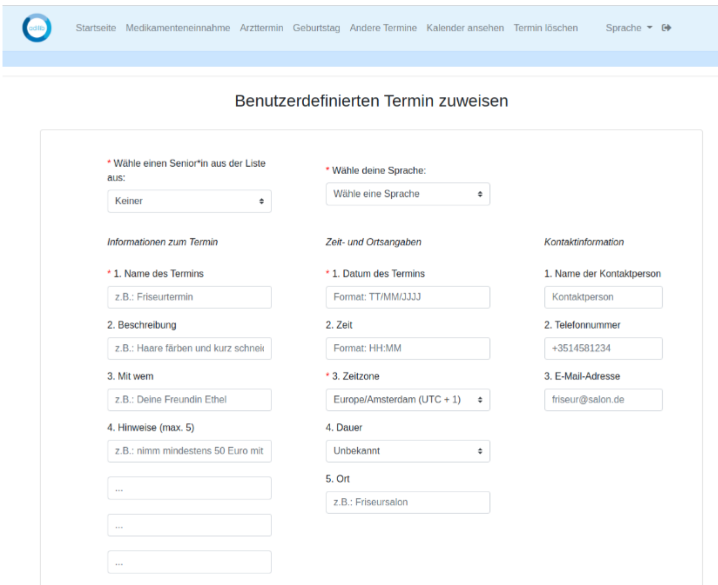

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3.5.2 Key performance indicators

Key Performance Indicators (KPIs) are defined as a set of measures that focus on the factors most critical to a project's success. KPIs are measurable and quantifiable with a target or threshold. They measure performance in critical areas by showing the progress or lack of it towards realising the objectives of each specific use case. The following KPIs have been chosen to determine whether or not the pilot for UC-UC-PT1-002 has been successful.

Failure to meet four or more of the KPIs indicates that repetition or major revisions to the use case and associated digital solutions are needed before entering further development oriented to commercialisation.

KPIs

The base of the evaluation is the German school grading system; 1 = very good/excellent, 2 = good, 3 = sufficient, 4 = poor, 5 = insufficient. Grade 3 should always be achieved. Table 67 contains the KPIs used for UC002.

Table 67: UC-PT1-002 KPIs

	school grading system / grade 3 should always be achieved = KPI (min.)									
		1 = excellent		2 = good		3 = sufficient		4 = poor		5 = insufficient
UC-PT1-002 KPI for phase 5		complies with		complies with		complies with		complies with		complies with
KPI 1: successful participant recruitment (2 participants)	1	2	2	n.a.	3	1	4	0	5	n.a.
KPI 2: How many recruited participants remained enrolled in the pilot until the end?	1	2	2	n.a.	3	1	4	0	5	n.a.

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KPI 3: How many % of the participants have an interaction with the digital assistant at least once during phase 5?	1	100%	2	<100-80%	3	<80%-60%	4	<60-50%	5	<50%
KPI 4: How many % of the participants have repeated interaction with the digital assistant during phase 5?	1	100%	2	<100-80%	3	<80%-60%	4	<60-50%	5	<50%
KPI 5: How high is the satisfaction with the digital solution? (TAM Score)	1	5	2	4	3	3	4	2	5	1
KPI 6: How many % of all support cases during the test phase are serious cases? What are serious support	1	5%	2	>5%-10%	3	>10%-15 %	4	>15%-20%	5	>20%

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cases? - System crash, user cannot log in, system does not collect data, support from/with technical partners necessary, …										
KPI 7: SUS Score (System Usability Scale)	1	Best Imaginable (100%)	2	Excellent (>80 %)	3	Good (80-60%)	4	Poor (<60%)	5	Worst Imaginable (<15%)
KPI 8: How many % of the participants are willing to use the digital solutions after the test phase?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 9: In general, how many % of the participants feel that it would be useful to develop a specific platform for healthy ageing?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%

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Summary						At least 70% of the KPIs must be met for the UC to be successful.				

3.5.3 Timeline of pilot activities

The original timeline of pilot activities, according to the Description of Work was to conduct Phase 1, 2 and 3 between May 2020 and July 2021, then Phase 4 (deployment in a controlled environment) in September 2021-April 2022 and Phase 5 between May 2022 and March 2023. Due to development issues of the digital assistant and the COVID-19 situation, there was a delay of eight months in total. Phase 3 had to be extended by three months compared to the original plan. Due to delays in the pilot, the deadline for the final deliverable was extended to June 2023, but Phase 5 still had to be shortened by six months (Table 68).

Table 68: UC-PT1-002 timeline for pilot activities

Task 6.2: Pilot Theme 1: Smart Living Environment for Healthy Ageing at Home			
UC-PT1-002: Digital Assistant to Support Older People to Live Independently and Remain Socially Connected			
Months		***original amendment***	***real timeline***
Nov 19	**1**	start of SHAPES	
Dez 19	**2**		
Jan 20	**3**		
Feb 20	**4**		
Mrz 20	**5**		
Apr 20	**6**		
Mai 20	**7**	phase 1	phase 1
Jun 20	**8**		
Jul 20	**9**		
Aug 20	**10**	phase 2	
Sep 20	**11**		
Okt 20	**12**		
Nov 20	**13**		

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Dez 20	**14**		phase 2
Jan 21	**15**		
Feb 21	**16**	phase 3	
Mrz 21	**17**		
Apr 21	**18**		
Mai 21	**19**		
Jun 21	**20**		
Jul 21	**21**	**ID**	
Aug 21	**22**	phase 4	
Sep 21	**23**		phase 3
Okt 21	**24**		
Nov 21	**25**		
Dez 21	**26**		
Jan 22	**27**		
Feb 22	**28**		
Mrz 22	**29**		
Apr 22	**30**		
Mai 22	**31**	phase 5	**ID**
Jun 22	**32**		phase 4
Jul 22	**33**		
Aug 22	**34**		
Sep 22	**35**		
Okt 22	**36**		
Nov 22	**37**		
Dez 22	**38**		
Jan 23	**39**		phase 5
Feb 23	**40**		
Mrz 23	**41**		
Apr 23	**42**	**D**	
Mai 23	**43**		
Jun 23	**44**		**D**
Jul 23	**45**		
Aug 23	**46**		
Sep 23	**47**		
Okt 23	**48**	end of SHAPES	

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3.6 Phase 2: Testing of mock-ups and prototypes

3.6.1 Methodology of testing

Aim

The aim of the mock-ups is to validate the functionalities of technologies in UC-PT1-002 and the way they are planned to be implemented, including the interaction with the users, based on the feedback provided by users. In addition, this research study also aims collecting new functionalities. The outcome of this research study provided technical partners the opportunity to integrate user feedback at an early stage of the technological development process.

Method

The appointments with the 18 seniors were conducted in presence, observing and fulfilling all the required Corona requirements. Six appointments, two hours each, took place. The seniors were divided into small groups of three to four participants. The composition of the groups was determined by the digital literacy of the individual participants. A differentiation was made between "no digital literacy" (no experience at all in dealing with digital technologies), "medium level" (already had experience) and "high level" (already has a lot of knowledge in the area of digitization). In order to create a feel-good atmosphere and an open culture of discussion, participants with similar levels of digital literacy were divided into groups. That ensures that no one was afraid to get involved in the discussion due to their (lack of) knowledge and openly communicate their ideas, suggestions and questions. Furthermore, small breaks were made, coffee and cake were provided and last but not least, the participants received a goodie-bag. The Phase 2 mock-up presentations with recruited participants were conducted between 28th June 2021 and 13rd July 2021.

A PowerPoint presentation was shown, during which participants were presented with brief background information about the SHAPES project and an overview of the purpose and features of the PT1–UC002 digital solutions. Mock-ups, e.g., visual images of all the types of screens a patient is likely to encounter when using the App, were then presented to participants. UC002 was presented to the participants together with UC001 and UC003.

The senior’s assessment was captured using two methods. Firstly, CCS observed the participants’ reactions during the presentation and noted down their comments and criticisms for later evaluation. Secondly, the participants were given a questionnaire to complete at home. The questionnaire included the following categories:

- Perception and comprehension – the participant understands the information transmitted, the necessity/advantages of using the digital solution.

- Interaction, intuition and function – the participant is able to find the desired information or complete his task without any previous knowledge or experience regarding the presentation or structure of the information offered
- Design and layout – the participant is able to recognize all symbols/icons, understandable/clear design of the digital solution
- General feedback – the participant should evaluate the usefulness of the application and name suggestions for the improvement to make the digital solution more user-friendly
- Experiences – the participant should report on their previous experiences with digital technologies.

Questions were guided by the standard ISO 14915, which specifies four principles for the design of multimedia applications. The principles are:

- Suitability for the communication objective — the presentation of the information is suitable for achieving the goals of the providers and visitors.
- Suitability for perception and understanding — the information transmitted is easy to understand and can be easily recorded.
- Suitability for exploration — the participant is able to find the desired information or complete his task without any previous knowledge or experience regarding the presentation or structure of the information offered.
- Suitability for user motivation — a participant must be encouraged to act. By focusing on the needs of the participants, an appealing presentation and goal-oriented guidance, the participant can be motivated.

Informed consent procedure

Eligible target users were provided with a participant information sheet (see Annex 5) explaining the background and purpose of the study and what they can expect to happen if they agree to participate. Those who agreed to take part were given a consent form (see Annex 6) and data security information (Annex 7). Signed consent forms and contact details were provided to the pilot leader to proceed with the study activities.

Informed consent for all participants were taken with the following accepted forms of signatures:

- Physical handwritten signature
- An electronic representation of a handwritten signature

The informed consent signed by participants were signed by the SHAPES manager at CCS to acknowledge reception and a physical or electronic copy of the document were provided to the participants by personnel of CCS.

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The consent process collected the following personnel:

- Name: in the consent form, for the purpose of identification of the accepted consent.
- Email (optional): if the signed consent form is sent to CCS by email, the same email was used to return a countersigned copy. Afterwards, the email was deleted for all other purposes of this project.

Address (optional): the participant may provide a physical address to receive the countersigned copy of the consent form. Afterwards, the address details were deleted for all other purposes of this research study.

3.6.2 Results of testing

Since at the time of the mock-ups the development of the digital assistant did not yet match the requirements, the presentation was very theoretical. The photos of the caregiver user interfaces provided by VICOM could only be presented to the participants in English, as the translation into German had not yet been completed. For this reason, the participants pointed out that they would only use a digital assistant if it was available in their native language. However, the skills of the assistant (reminder, agenda, how-tos, etc...) were considered useful and helpful by the majority of the participants.

The theory was difficult to comprehend / imagine, especially for the participants with no to medium experience in using digital technologies. The consequence is that the feedback received from the participants is limited - Feedback was generated from 15 participants through the questionnaire. However, most of the questionnaires were not even half filled out. An overview of the questionnaires is provided in Annex 24.

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3.7 Phase 3: Hands-on Experiments

Due to the COVID-19 situation and the unavailability of the digital assistant, the hands-on experiments could not take place. CCS had planned to schedule the hands-on experiments as soon as the digital assistant was developed to the required state to be presentable to the participants. However, due to the huge delay and time management together with the WP leader it was decided to cancel the hands-on experiments and to proceed with phase 4.

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3.8 Phase 4: Small Scale Live Demonstration

3.8.1 Recruitment of participants

The initial plan was to run the phase with participants from previous phases. From the experience of other projects, CCS has learnt that it is useful for CCS staff to test digital solutions in advance in order to identify problems or technical errors.

Therefore, CCS tested the digital assistant internally. This was all the more important because the level of development of the digital assistant did not yet meet the requirements and the test would have been too complex for the seniors. The risk of losing participants in phase 4 due to insecurity or intimidation by the non-user-friendly technology was considered too high by CCS. A total of three CCS project staff were involved in the testing.

3.8.2 Technical aspects & Logistics

Validations

The three CCS employees tested the solution from different perspectives, two from the point of view of the care recipient and one from the point of view of the care giver in order to validate the necessary aspects of the digital solutions:

3.8.3 Roles and Responsibilities

CCS personnel was in charge of the set up and training process. All technical issues were communicated to the technical team by VICOM, which took action as needed. Ethical considerations

As the testing of the platform, solutions and devices was only carried out internally by the CCS staff, no ethical considerations had to be taken into account.

3.8.4 Ethical considerations

An ethical self-assessment for phases 1–5 of this use case has been completed.

Data Protection Impact Assessment (DPIA) was finished before the start of the pilot (including the data risk assessment).

Data Processing Agreements were finished before the start of the data collection. CCS is the data controller and, as such have access to the full dataset. Data Processing Agreements are in place to facilitate the sharing of pseudonymised data with specific SHAPES partners for specific purposes.

An ethical approval was not necessary in phase 4 because of the internal test.

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3.8.5 Outcome of the Small-Scale Live Demonstration

The application was tested by CCS staff with the help of a test protocol (Annex 25) and test dates (Annex 26). It was used as overview for the test persons from the perspective of the care receiver to know which dates have been included to the digital assistant for their person. Overall, the operation of the digital assistant is very intuitive and user-friendly. However, there were a few issues that made it difficult to use, and these could only be resolved after consultation with VICOM. For example, a skill had to be completed with a word first, or the assistant got stuck in a loop and could not understand further instructions.

Table 69 shows a brief overview of the results.

Functions	Outcome
After successful login, the chat bot opens.	Works as described
Activation of the digital assistant with activation sentences "Hey Nari".	Works as described
Voice navigation can be used to communicate with the digital assistant.	Very difficult. It works only a few times, then the assistant does not understand what one is saying.
Text navigation can be used to communicate with the digital assistant.	Works as described
When asking about upcoming dates, all dates are listed in full.	Works as described
Reminders occur at the right time.	Only works, when the assistant is opened in browser. Past appointments are not reminded - If a time window is missed (e.g. device not switched on), the reminder does not occur.
Entering different skills works smoothly when using the required activation sentences.	Does not work. (Was clarified afterwards. Digital assistant got stuck in a loop.)
Questionnaires occur at the right time.	If the digital assistant is opened in the browser, the reminder to answer the questionnaire occurs. Otherwise care

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	receiver is not informed about the questionnaire. Not even later.
Questionnaires can be answered via voice or text.	Works as described.

Table 69: UC-PT1-002 Outcome Phase 4

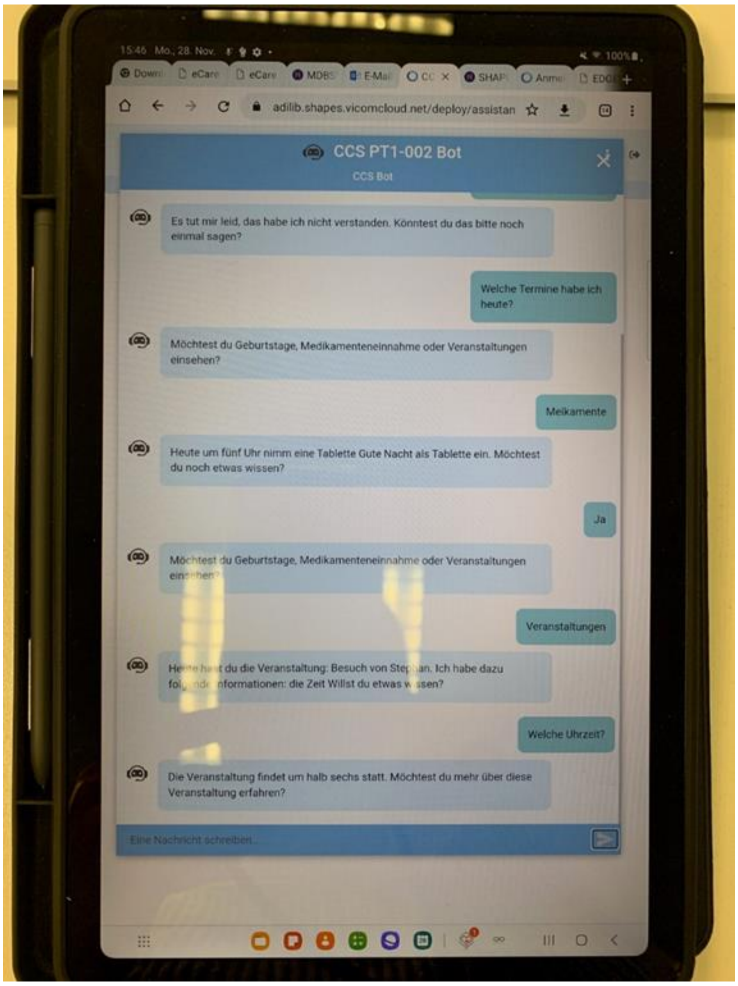

Figure 17: UC-PT1-002 Care receiver interface

There were also a number of suggestions from the carers' perspective on how to improve the use of the digital assistant. Suggestions for improvement were mainly related to the design and usability of the Caregiver interface. The design was very confusing, not intuitive and very complex. This meant that the caregiver task was very time consuming and therefore more of a burden than a relief. A summary of the feedback given to the technical partner (including recommendations) can be found in Annex 27.

3.9 Phase 5: Large-scale pilot activity lead CCS

A large-scale live demonstration of the SHAPES Platform and digital solutions being deployed in the PT1-002 was undertaken during Phase 5 of the SHAPES pan-European pilot campaign at CCS.

Implementing the SHAPES large-scale (Pan-European) pilot campaign aims to validate the SHAPES capabilities and benefits to care recipients, caregivers and care service providers across different regions, cultures and health and care organizational models. It also aims to assess the impact of the SHAPES in supporting healthy ageing and independent living and the definition of improved integrated care policies and measures.

Phase 5 was a pilot test with an optional qualitative interview component. The aim of the Phase 5 pilot test was to determine the effectiveness of using the SHAPES platform and devices to improve the wellbeing of older people. Specifically, the digital assistant solution was tested and evaluated to see if it assists participants with a defined set of skills, such as agenda management, reminders, or how-to skills. User engagement was measured and the self-perceived usefulness of a digital solution to help older people stay active, including promoting social activities, were addressed.

The pilot was replicated by AIAS Bologna Onlus (AIAS), Clinica Humana (CH) and Asociación Benéfico Social El Salvador / Universidad de Castilla-La Mancha (SAL).

The digital solution was evaluated at the beginning and end of phase 5. An evaluation after three months was not possible because the previous phases and thus phase 5 were delayed (see 3.5.3 timeline pilot activities).

3.9.1 Recruitment

With regard to the evaluation of digital solutions, a sample size of 15 participants was targeted for this pilot study. This sample size was chosen pragmatically to be as representative as possible of the target population, large enough to provide valid responses and within the resources available. In Phase 4, it became clear that the digital assistant was not yet developed enough to be tested by many participants. In addition, CCS decided that participants should have sufficient digital literacy to test the digital assistant. As the time and effort required to follow up participants in phase 5 would be enormous, CCS decided to recruit only 2 participants in total. In addition, one care giver has been recruited in phase 5.

Apart from the carer, no new participants were recruited for the pilot activity of PT1. The seniors from phases 3 and 4 remained part of the project and participated in the development process in order to ensure continuity. As the participants followed the development from the beginning, the co-creation approach could be used to further improve and adapt the digital technologies. In addition, a consistent group of

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participants increased efficiency as they already knew each other and worked well with the CCS. The seniors were already familiar with the functions and challenges of the digital technologies developed in the project. CCS performed several recruitment activities to create awareness for the project and to find suitable pilot participants for the testing. The following steps were taken by CCS to recruit participants for the pilot activities:

- Invitation of senior citizens to the information event “senior citizen café” through a newspaper advertisement;
- Newspaper advertisement in a free regional newspaper (“Wochenkurier”);
- Presentation to participants from other CCS projects (HoCare2.0, GATEKEEPER);
- Recruitment in the context of CCS public relations (CCS newsletter, LinkedIn, Xing, CCS website);
- Recruitment in the personal environment of CCS employees.
- Enquiry with the pilot participants who have already taken part in the CCS lead pilot site

First communication about the pilot has been conducted via senior citizen event from the research team to present all relevant information (see Annex 5) and answer questions from the potential participants. Afterwards information sheets and consent forms were sent out to eligible participants in case they still showed interest in the study.

Eligibility criteria

Inclusion criteria:

- person aged 65 years old or older at the time of recruitment
- living in Dresden and the surrounding area (radius < 50km)
- living on their own or with a partner (cohabitation, marriage)
- self-reported capacity to use the App installed on the tablet
- self-reported capacity to consent
- has daily access to internet/Wi-Fi at home

Exclusion criteria:

- Lack of digital skills to use a tablet/smartphone
- Lack of internet access

As in the previous phases a written consent form (Annex 6) and data security documents (Annex 7) were obtained from all participants before the pilot activities started. Signed by each participant and the original is stored in a locked cupboard at CCS premises. Only CCS staff has access to the originals. A copy was given to each participant.

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In addition, all participants received an information sheet on the pilot action (Annex 13). The care giver received a manual summarising the steps to use the digital assistant (Annex 28).

3.9.2 Communication and dissemination of pilot activities

Any data that arise from the pilot study is owned by CCS, with the support of VICOM. On completion of the study, all data was analysed and tabulated and used to prepare a final report, available as one of the agreed deliverables of the SHAPES Innovation Action — Deliverable D6.2. This deliverable (and all other agreed deliverables) is available to the public for review and accessible via the SHAPES website (www.shapes2020.eu). Participants are notified of the outcome of the study. CCS seeks to disseminate the findings from this study at conferences and in the scientific literature. Moreover, CCS disseminates the results of the pilot activities through CCS public relations (CCS newsletter, CCS website, LinkedIn, Xing). As per the SHAPES Publication Protocol, all publications arising from this study reflect the range of effort that has made them possible; including conceptualisation of the research project and research task, methodology development, data collection and analysis, interpretation and discussion of results; as well as project management. Any publications are read and meaningfully contributed to by all named authors. Participating SHAPES partners have the rights to use data from this study in their own analysis and dissemination plans. As detailed under 'Access to Data', Data Processing Agreements have been set up and signed by all partners to facilitate the sharing of pseudonymised data with specific SHAPES partners for specific purposes.

The pilot participants will receive a separate and summarised report in national language on the project results. This is an appreciation towards the participants. The participants gave their time, patience and experience to the project, thus it is still important to inform them about the results and outcomes of the project. The participants carry this information and the SHAPES idea into their community and contribute to its dissemination. This is good and beneficial for the sustainability of the project.

3.9.3 Risk management

All foreseeable data-related risks have been compiled into detailed risk assessment documents, which form part of the Data Protection Impact Assessments for Phase 5 PT1-002 conducted in CCS. A risk classification, root cause, name, and consequences were assigned for each risk identified. Once identified, each risk was then analysed and attributed a score from 1 (unlikely/minor) to 4 (almost certain/critical) for probability and impact. Subsequently, appropriate mitigation actions were assigned, and an appropriate person responsible was identified. These risks have been reviewed periodically (Annex 14).

In addition to data risks, there are a few risks identified, namely:

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- Adherence to the intervention due to digital literacy issues, demotivation, difficulties in physical coordination, cognitive difficulties, or lack of interest.
- Risks associated with technology functioning at participants' home - such as device malfunction or difficulties in assembling the equipment
- Risks related to the pandemic situation - the increase in the number of cases of people infected with COVID-19 may imply delays in data collection.

3.9.4 Outcome of large-scale pilot activity

Overview

The phase 5 large-scale pilot of the SHAPES UC-PT1-002 was conducted between January 2023 and April 2023 with 3 participants (one caregiver, two care receiver). Table 70 shows an overview of the sociodemographic information of the participants. A test period of 8 weeks was planned. However, due to the stage of development, CCS decided to conduct the test with the participants accompanied. After the first test, the participants were so frustrated that they were not available for further tests with the digital assistant. Therefore, the different skills of the digital assistant were tested with each participant for one day. The dates were agreed with the carer. The carers then tested the digital assistant. Test dates and a test protocol can be found in Annex 29 and Annex 30.

To evaluate the results of phase 5 various tools were used for the evaluation. The results are presented according to the following subdivision:

- *Primary and secondary outcomes*
- *Recommendation for technical partners*
- *Evaluation of use case by using MAST*

Table 70 gives an overview of the sociodemographic information of the participants.

Table 70: UC-PT1-002 Sociodemographics of the participants

Variables	Number of participants	Value
Age (years)	care receiver: 2 caregiver: 1	Average age care receiver = 71 Average age caregiver = 26
Gender Male	 1 (CR)	 33,33 %

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Female	1 (CR) + 1 (CG) =2	66, 67 %
Technological skills:		Advanced user: 2 Beginners: 1
Country:	Germany	100 %
Marital status: Married: Other?	 2 1	 66,67 % 33,33 %
Occupational status: Retired Other?	 2 1	 66,67 % 33,33 %
Residence: House Flat	 2 1	 66,67 % 33,33 %

Primary and secondary outcome

The primary outcomes were to measure a predefined set of KPIs which have already been presented in chapter **3.5.2** as well as to evaluate the UC-PT1-002 use case using the MAST evaluation tool.

Table 71 provides an overview of the pilot with regards to KPIs.

Table 71: UC-PT1-002 KPIs Overview

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	school grading system / grade 3 should always be achieved = KPI (min.)									
PT1-UC002 KPI for phase 5		1 = excellent complies with		2 = good complies with		3 = sufficient complies with		4 = poor complies with		5 = insufficient complies with
KPI 1: successful participant recruitment (2 participants)	1	2	2	n.a.	3	1	4	0	5	n.a.
KPI 2: How many recruited participants remainded enrolled in the pilot until the end?	1	2	2	n.a.	3	1	4	0	5	n.a.
KPI 3: How many % of the participants have an interaction with the digital assistant at least once during phase 5?	1	100%	2	<100-80%	3	<80%-60%	4	<60-50%	5	<50%
KPI 4: How many % of the participants have repeated interaction with the digital assistant during phase 5?	1	100%	2	<100-80%	3	<80%-60%	4	<60-50%	5	<50%
KPI 5: How high is the satisfaction with the digital solution? (TAM Score)	1	5	2	4	3	3	4	2	5	1
KPI 6: How many % of all support cases during the test phase are serious cases? What are serious support cases? - System crash, user cannot log in, system does not collect data, support from/with TecPartners necessary, …	1	5%	2	>5%-10%	3	>10%-15 %	4	>15%-20%	5	>20%
KPI 7: SUS Score (System Usability Scale)	1	Best Imaginable (100%)	2	Excellent (>80 %	3	Good (80-60%)	4	Poor (<60%)	5	Worst Imaginable (<15%)
KPI 8: How many % of the participants are willing to use the digital solutions after the test phase?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 9: In general, how many % of the participants feel that it would be useful to develop a specific platform for healthy ageing?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
Summary						At least 70% of the KPIs must be met for the UC to be successful.				

KPI 1 Successful participant recruitment (target 2 participants)

Table 72: UC-PT1-002 KPI 1

Parameter	CCS
Target number of participants	2
Number of participants recruited	3
Percentage recruited	100 %

The target of 2 participants was exceeded as one care giver was recruited in addition to two participants.

KPI 2 How many recruited participants remained enrolled in the pilot until the end?

Table 73: UC-PT1-002 KPI 2

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Parameter	CCS
Number of participants at baseline	3
Number of withdrawals	0
Number of participants at end of study	3
Percentage retained	100 %

All participants did complete the pilot till the end.

KPI 3 How many % of the participants interacted with the digital assistant at least once during phase 5?

Table 74: UC-PT1-002 KPI 3

Parameter	Value
Total Participants	3
Number of participants who interacted with the digital solution once a day.	3
Percentage	100 %

All of the participants used the digital assistant at least once during phase 5.

KPI 4 How many % of the participants interacted with the digital assistant several times during phase 5?

Table 75: UC-PT1-002 KPI 4

Parameter	Value
Total Participants	3
Number of participants who used the digital assistant more than once.	0
Percentage	0 %

The digital assistant was not used much by either carers or care recipients in Phase 5 because it was inconvenient, time consuming and not very helpful to use. In order to work with the digital assistant, it had to be open in the browser and remain open at all times. Once the tablet screen was locked, the assistant could no longer be used. In addition, any reminders that had been set were not communicated to the user at that moment, even if the user logged in later and activated the assistant. As a result, the functionality of the digital assistant could only be tested if the scheduled appointments were known in advance so that the assistant could be opened in the browser at the specified time. In addition, the voice control of the digital assistant did not work, which led to a very high level of frustration among the participants, as the operation was very complicated and inconvenient and did not provide any benefit.

KPI 5 How high is the satisfaction with the digital solution? (at least 3 in TAM Score)

Table 76: UC-PT1-002 KPI 5

Parameter	Value
Total participants	3
(This technology is useful to me.) Number of participants who rated this question with at least 3.	0
(If this technology is available to me in future I would use it.) Number of participants who rated this question with at least 3.	0
Percentage of satisfied	0 %

KPI 6 How many % of all support cases during the test phase are serious cases? What are serious support cases? - System crash, user cannot log in, system does not collect data, support from/with technical partners necessary, …

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Table 77: UC-PT1-002 KPI 6

Parameter	Value
Number of support cases	N.A.
Percentage supported	N.A.

Due to poor user performance in terms of application, handling and usability, the Digital Assistant could not be used independently. Ongoing support was therefore required. The KPI was therefore not met.

KPI 7 SUS Score (System Usability Scale)

Table 78: UC-PT1-002 KPI 7

Parameter	Value
Number of participants evaluated	3
score	28

The SUS score for the caregiver was 35 and for the care recipients only 25. Overall, this results in a below average score of around 28. (Annex 31)

KPI 8 How many % of the participants would continue to use the digital assistant after the test phase?

Table 79: UC-PT1-002 KPI 8

Parameter	CCS
Total participants	3
Number of participants with further use	1
Percentage	33,33 %

One participant would continue to use the digital assistant. However, only if it was adapted to the current state of technology and provided real benefits. The participants who declined further use were put off by the stage of development of the digital assistant, thus justifying their decision not to continue using it.

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KPI 9 In general, how many % of the participants feel that it would be useful to develop a specific platform for healthy ageing?

Table 80: UC-PT1-002 KPI 9

Parameter	CCS
Total participants	3
Number of participants who feel that it would be useful to develop a specific platform for healthy ageing?	3
Percentage	100 %

All the participants believe that a specific platform for healthy ageing in every country would be very useful.

Overview of KPI achievement

Table 81: UC-PT1-002 Overview KPI achievement

Key performance indicator	Achieved during large-scale pilot activity (yes/no)	Comments
KPI 1	yes	Score 1
KPI 2	yes	Score 1
KPI 3	yes	Score 1
KPI 4	no	Score 5
KPI 5	no	Score 5
KPI 6	no	Score 5
KPI 7	no	Score 5
KPI 8	no	Score 4
KPI 9	yes	Score 1

Overall KPI from UC002: At least 70 % from all KPIs must be successful.

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Table 82: UC-PT1-002 KPI Overall

Parameter	Value
Number of KPIs	9
Number of successful KPIs	4
Percentage	44,44 %

Conclusion:

The objective was not achieved as more than half of the KPIs were not met. Based on the SUS score and the interviews with the participants, it can be concluded that the use case was not successful. Although all seniors interviewed considered a digital assistant and a platform for healthy ageing outside of conventional assistance systems to be useful, the stage of development of the digital assistant developed in the project made the test difficult. The usability and usefulness of the application was not given. Safety in the home environment can certainly be improved by digital assistance systems. However, they must meet certain requirements and their operation must not be unnecessarily complex and time-consuming. Instead, they need to be intuitive and self-explanatory. It became clear that although seniors are open to using digital systems, they quickly lose motivation if problems with the system occur frequently. The frustration threshold is very low once they feel that they cannot understand and operate the technology. In order to integrate the use of a digital assistance system into the lives of seniors in a sustainable way, the desire for privacy and user-friendliness must be reconciled.

Evaluation of MAST

The MAST framework as already introduced in chapter *3.4.2. Planning of evaluation.* A complete overview of the harmonised date can be found in Annex 32. The evaluated data/outcome are presented in the Table 83 below.

Table 83: UC-PT1-002 Evaluation of MAST

MAST Domain	Topic	Outcome	Baseline (mean/SD)	End of pilot (mean/SD)	Change in mean (SD)
Clinical	Mental health	OSSS-3 (social	M = 11,67 SD = 0,94	M = 11,67 SD = 0,94	

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		support) and life events	Med = 11 Min = 11 Max = 13 **“strong social support”**	Med = 11 Min = 11 Max = 13 **“strong social support”**	
	Effects on health-related quality of life	EQ-5D-5L VAS	**Health Status** M = 88,33 SD = 6,24 Med = 90 Min = 80 Max = 95	**Health Status** M = 88,33 SD = 6,24 Med = 90 Min = 80 Max = 95	
		WHOQOL-BREF scores	**Domain 1** M = 29,67 SD = 3,30 Med = 29 Min = 26 Max = 34	**Domain 1** M = 29,67 SD = 3,30 Med = 29 Min = 26 Max = 34	
			Domain 2 M = 26,33 SD = 1,25 Med = 26 Min = 25 Max = 28	**Domain 2** M = 26,33 SD = 1,25 Med = 26 Min = 25 Max = 28	
			Domain 3 M = 10,33 SD = 2,05 Med = 10 Min = 8 Max = 13	**Domain 3** M = 10,33 SD = 2,05 Med = 10 Min = 8 Max = 13	
			Domain 4 M = 35,33 SD = 1,25 Med = 35 Min = 34 Max = 37	**Domain 4** M = 35,33 SD = 1,25 Med = 35 Min = 34 Max = 37	
Patient perspectives	Satisfaction and acceptance	User acceptance (TAM score)	/	**Ease of use:** M = NA SD = NA Med = NA Min = NA Max = NA	
				Future use: M = 1 SD = 0	

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				Med = 1 Min = 1 Max = 1	
				Usefulness: M = 1 SD = 0 Med = 1 Min = 1 Max = 1	
	Understanding of information Confidence (in the treatment) Ability to use the application Access & Accessibility	Usability of application (SUS Scores)	/	M = 28,33 SD = 4,71 Med = 25 Min = 25 Max = 35 **<60% (M) = significant usability problems**	
		Usability of application (1-item health literacy)	M = 4,33 SD = 0,47 Med = 4 Min = 4 Max = 5	M = 4,33 SD = 0,47 Med = 4 Min = 4 Max = 5	
	Empowerment Self-efficacy	Self-efficacy (GSES)	M = 31,33 SD = 0,94 Med =32 Min = 30 Max = 32	M = 31,33 SD = 0,94 Med =32 Min = 30 Max = 32	
Economic aspects	Amount of resources used when delivering the applicati	Cost of devices (Cost as per device purchasing invoice)	• Tablet: 328,57€ • Protective cover tablet: 13,99€ • Loudspeaker: 87,31€		

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	on and comparators	Cost of using digital solutions and SHAPES platform	• Electricity (charging the tablet) • Wi-Fi connection: • Server VICOM: • Different applications: • SHAPES platform itself: • SHAPES Marketplace:
		Cost of staffing (Timesheets and costing data)	• Training the users • Travel cost • Development updated version • Remote support via phone • Support in person
***Not available as they were customized solution, and they aren't at a commercial stage as yet**			

Secondary outcomes

At the end of the phase 5, final interviews were conducted with the participants (see Annex 20). These contained questions divided into four different categories:

- Perception and understanding;
- Interaction / Intuition / Function;
- Design / Layout;
- General feedback.

Results can be seen in Annex 33.

Perception and understanding

The care receiver participants agreed that the chat bot in UC 002 was understandable, but the caregiver participant finds the handling very complex and unclear. They suggested a more structured interface, e.g. for the agenda, as the listing of appointments is very confusing. Further they had to enter each skill via a different link. It would have been easier to use if each skill had been accessible from a single interface. The integration into the SHAPES App was also a suggestion, as all relevant skills / possibilities can be viewed at a glance.

Interaction / Intuition / Function

The operation was generally understandable for the carers. Activating the digital assistant with the activation phrase "Hey Nari" worked very well for all participants. They also knew how to use a digital assistant in general, but as there were many difficulties with voice navigation, they were not able to use the digital assistant in the usual way but had to navigate and communicate with the assistant through text. That

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was very disappointing and frustrating. For the carer, the application was much more complicated. The application was not considered intuitive. Using the various links was complicated and not user-friendly.

Design / Layout

Participants rated the layout from "okay" and "neutral" to "good" and "understandable". But they were not overly enthusiastic. The design could be improved. However, all the content was easy to read.

General feedback

In general, the participating seniors consider a platform like SHAPES to be useful and innovative. They are convinced that digital technologies can prolong independent living at home and increase their sense of security. The basic idea of the use cases was also seen as helpful, but due to the lack of development, the practical illustration was missing. However, the capabilities themselves are helpful. Reminders to take medication are becoming more and more important, and reminders for doctor's appointments or other events can also be a support in everyday life. However, the digital assistant must be state-of-the-art and integrated into the platform. It should also be easier to use and less time-consuming, especially for the carer.

There was disagreement about who should pay for the use of such a platform. Some would be willing to pay for it, depending on the final level of implementation, the cost, and only if there was a free trial period. Others would not pay for it.

In terms of usefulness, the other case studies were considered more useful, as there are already some digital assistants available on the market. The application is nice to have but not absolutely necessary and not applicable or useful at the current stage of development anyway. A part of the participants would only continue to use the digital assistant, provided that the development meets the actual state of the art and taking into account the suggestions for improvement. They think that the technical solution in general could be suitable for;

- Assisting the participants with a defined set of skills, for instance the agenda, reminder or how-to skills
- Assisting older people in to keep active, including the promotion of social activities.

Recommendations for tech-partners during and after the pilot

Overall, the technical solution was not rated well by the 3 participants (SUS Score 28,33). The digital application was underdeveloped and could not meet the expectations of the participants after the presentations in phase 3. Participants were dissatisfied with the result and rated UC002 as not user-friendly.

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There are several recommendations for improvement, firstly to develop the digital assistant according to the state of the art. The following points could be identified:

- Improve the Natural Language Processing (NLP) Capabilities
- Make the voice navigation for caregiver not only care receiver, as it would make it easier to enter the information
- Make the digital assistant competitive to other assistants like ‘Siri oder Alexa’
- Make the access easier and user-friendly, no browser-based solution
- Integrate the digital assistant to the SHAPES App

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3.10 Phase 5: Large Scale Pilot Activity replicating site CH

Originally, Clinica Humana, Spain (CH) was also planned as a replication site for UC-PT1-002. Due to the difficult recruitment measures and the already high number of UCs carried out by CH, it was decided together with Fraunhofer Gesellschaft (FhG), as the WP6 leader, to release (CH) from replicating UC001 and UC002.

3.10.1 Recruitment

The recruitment measures proved to be very difficult due to the underlying target group. The following reasons led to CH not being able to replicate the UC002:

Lack of interest and willingness from individuals to participate, leading to an insufficient sample size for conducting the research. CH contacted potential participants among Humana's patients on the island of Mallorca, however, not all patients were eligible to participate for their particular health situation. Moreover, CH led 4 Use Cases within SHAPES and potential participants had already been contacted to participate in those other Use Cases and they were not willing to participate in another one.

CH also provides health care to patients in residential care homes, however, for Use Cases UC-PT1-002, participants had to live at their own homes, which was another limitation to find potential participants for this replication.

Three of the participants contacted were willing to participate, however, when we explain them the Use Cases in more detail, all of them got scared regarding the data collection methods, they didn't like the idea of having sensors installed in their homes to monitor their daily living activities. Some of they said that they had to discuss it with their relatives and the research team from CH contacted families of potential participants to explain the data security measures, explaining that GDPR and ethics were in line, however, all of them refused to participate.

These points were discussed with the pilot lead (CCS) and the WP6 lead (FhG) and it was decided that CH does not need to replicate UC-PT1-002 under these circumstances.

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3.11 Phase 5: Large Scale Pilot Activity replicating site UCLM/SAL

Table 84: UC-PT1-002 Replicating Site UCLM/SAL

Replicating site	
Name	Asociación Benéfico Social El Salvador / Universidad de Castilla-La Mancha
Shortcut	SAL/UCLM
Location	Ciudad Real (Spain)
Participants involved in replicating of this UC (Number in total)	0
Duration of replicating (days)	0 days

3.11.1 Recruitment

The recruitment process for Pilot 1, use case 2 of the Shapes Project was unfortunately halted due to an unforeseen issue related to ethical approval. Our experiment design, which was a crucial component of this phase, required an approval from the ethics committee to proceed. This approval process necessitates the submission of our protocol and comprehensive experiment details in English. However, we were unable to get these documents translated into English with the requisite lead time. Consequently, the submission to the ethics committee was delayed, which ultimately resulted in our inability to secure the ethical approval within the necessary timeframe. This unforeseen setback has meant that the recruitment process for this particular use case could not be carried out as originally planned.

3.11.2 Risk management

In the course of implementing the use case, we have identified a potential workaround for the ethical approval delay in Pilot 1, use case 2. This involved conducting the use case with the researchers themselves participating in the experiment, thereby bypassing the need for immediate external recruitment. While this approach has potential benefits in terms of continuity and timely progress, it was not feasible due to the limited timeframe available for replication.

The replication of the use case is a meticulous process that demands time and resources to ensure accurate and reliable results. Given the complexities and the attention to detail required in this stage, it would be challenging to expedite this

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process without compromising the integrity and validity of the results. Hence, while the researchers' participation could have served as a plausible solution to the delay in ethical approval, the restricted timeframe for replication precluded us from pursuing this option.

This has been recognized as a risk within our project management framework, and as a lesson learnt for the future, it is important to ensure that all required documents are prepared in the necessary languages well in advance and building in sufficient time for all stages of the experiment, including potential replication scenarios.

3.11.3 Outcome of large scale pilot activity

Conclusion:

Despite our best efforts, the large-scale pilot activity for Pilot 1, use case 2 has not been executed as initially planned. The delay in obtaining the necessary ethical approval due to the late translation of the protocol and experiment details into English meant that we were unable to initiate the pilot activity.

While this has been a significant setback, it has also been a valuable learning experience. We have identified the need for more efficient planning and early preparation of all required documents, specifically in the necessary languages for timely submission to the ethics committee.

Recommendations for tech-partners during and after the pilot

The following recommendations have been identified:

- Improve Natural Language Processing (NLP) Capabilities: The voice interface of Adilib seems to be underperforming. It's critical to invest more resources into improving its natural language understanding and speech recognition capabilities. This could involve implementing more advanced NLP techniques or leveraging existing NLP libraries and tools.
- Expand Skill Set: The current range of skills provided by Adilib appears to be limited. It would be beneficial to conduct a user study to understand the needs and preferences of the target user group, particularly older adults, to identify and develop a broader range of skills that would be useful and relevant to them.
- Benchmark against Industry Standards: Given that users are already familiar with advanced digital assistants like Alexa or Siri, it's important to ensure Adilib is competitive. This might involve analyzing the key features of these advanced assistants and integrating similar functionalities into Adilib, while maintaining a user-friendly and intuitive interface.
- Simplify User Training: The current user training process seems to be overwhelming for older adults. It's recommended to simplify this process, perhaps by creating easy-to-follow tutorials, providing interactive demos, or incorporating a

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step-by-step guide within the digital assistant. Also consider a more intuitive, conversational onboarding process that can be handled by the assistant itself.

- Prioritize User-Friendliness for Older Adults: Given that the target demographic is older adults, special attention should be paid to making the interface and functionalities as user-friendly as possible. This could involve larger text sizes, simpler commands, clear visual cues, and more responsive feedback mechanisms.
- Iterative Testing: Regular user testing with your target demographic can help uncover usability issues early and ensure that improvements are having the desired effect. This should be an ongoing part of your development cycle.

By focusing on these areas, the technical partners can significantly enhance the performance and user experience of Adilib, making it a more effective and appealing tool for its intended users.

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3.12 Phase 5: Large Scale Pilot Activity replicating site AIAS

Table 85: UC-PT1-002 Replicating Site AIAS

Replicating site	
Name	AIAS Bologna Onlus
Shortcut	AIAS Bologna
Location	Bologna (Italy)
Participants involved in replicating of this UC (Number in total)	3
Participants in the role of a care receiver Number	 2
Participants in the role of a caregiver Number	 1
Participants in the role of a researcher Number	 1
Duration of replicating (days)	10

3.12.1 Recruitment

Due to time constraints the recruitment process was informal, and participants were recruited within the network of employees of AIAS Bologna. We recruited 3 persons, two care receiver and one caregiver.

Inclusion criteria:

- person aged 65 years old or older at the time of recruitment
- living independently
- able to use basic technology
- self-reported capacity to consent

Exclusion criteria:

- Inability to give an autonomous informed consent.

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3.12.2 Communication and dissemination of pilot activity

AIAS aims at disseminating the findings of the replicating pilots at conferences and other events related to health care technologies.

3.12.3 Risk management

The replication of this use case was challenged by the time constraint and the function of the technologies itself. We manage anyway to conduct a small pilot where we asked people to test the application in order to give feedback to our technical partners. We engage them in a small co-design process supported by our team in order to anyway get feedback on the potential of this kind of technology. This strategy allows us also to get the technology tested by a group of users and learn more about the process of involvement in the use of this type of technology, included training needs.

3.12.4 Outcome of large scale pilot activity

Overview

The limited timeframe available for replication precluded the implementation of the overall planned process and we weren't able to collect all the statistical data needed for the analysis as we concentrate on the functionalities and the qualitative feedback of the users.

Secondary outcomes

Perception and understanding

The intended use of the App was quite clear for all the participants, especially for the ones that have already the chance of using other technologies in their life. However, all participants didn't find the application, at the stage it was tested, particularly useful for their life. The layout was easily understandable by all and they enjoyed it, but they didn't find it not particularly attractive stating that it should be improved making it more interactive. The caregiver appreciated the level of customization that could be achieved by exploiting the capabilities of the skill builder recognizing that it could be very promising for people who don't know how a chatbot works but want to customize a voice assistant. On the other side, both of the users didn't like the interaction with the chatbot because "*it was hardly ever able to provide the information asked and it kept on repeating messages such as 'I'm sorry, I did not understand, can you repeat?*'

As regard the functionalities it was underlined that the need to open the chatbot window pressing on an icon placed in the bottom right-hand corner could be avoided and that it is preferable that when entering the App, the chatbot is already open.

Interaction / Intuition / Function

The interaction was found quite easy, except the fact that they need to press the button to open the chatbot windows. From caregiver side it was understandable how to build activities, to dos and remainders but it was intuitive how to interact with the chatbot and what requests could be made to the chatbot.

Appearance / Layout

The layout of the application was not particularly engaging, and the participants underline that it could be for people not used to technology. Also, the colours and contrasts were not found to be very good: "*The colour scheme is too homogeneous and it's not differentiating enough the different parts of the interface."*

The part of the how-tos and of reminders it was a bit overwhelming, with too much stuff to complete, so the feedback was to simplify the part with fewer mandatory fields.

General feedback

In general, the concept of the App was found interesting and potentially very useful for older people, but it would be better to integrate the assistant in a physical device such as a robot or a speaker like Alexa. For the purpose of this use-case, indeed, the fact that you need to open a chatbot that reminds you things was considered counterintuitive, since you need to remind yourself to open the chatbot itself first.

At this stage, people affirmed that technologies are not ready enough to be exploited on the market. There is some potential in the ideas, but the technology as they have tested now lack of consistency and stability and this impact to the willingness of paying for it. At the moment, the technology tested is not responding to real needs and requirements.

Recommendations for tech-partners during and after the pilot

The following recommendations have been identified:

- Improve Natural Language Processing Capabilities: The voice layer needs to be trained more to support better some languages (including Italian).
- Clarify and expand the skill Set: having clear in mind which are the skills that you can use improve the understanding of the possibilities and the actual response to individual needs, the usability of the system and it could make the implementation process smoother.
- Improve the interface with accessibility functions.
- Make the interface more user friendly: i.e. chatbot that directly open and without the need to go through the icon at bottom right-hand corner, colour scheme more differentiated, more contrast for the typing bar. Chatbot avatar could also change in order to look friendlier to users.
- Make the customization of the user interface and the user skills easier.

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- Make the system more automated (i.e. the system automatically notifies the appointment alerts, suggest tutorials, etc.)
- Integrate the chatbot in other physical devices (e.g. Alexa, robots)

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4 Use case 003

4.1 Introduction

This chapter describes the pilot activities of UC-PT1-003 *Overcoming the fear of digital technologies – competent usage of technologies – problem solving in the community*. Target persons of this use case are aged 65 and older, living independently or with sporadic supervision in rural or urban areas of Saxony, Germany. The SHAPES Persona for this pilot theme is 'Ernst':

Ernst is 75 years old, a recently retired former teacher from a college. He lives with his wife Alberta in a small town in Bavaria in their family home with a garden. Ernst is in very good health, he exercises every day for 30 minutes in the morning. His digital literacy and affinity to technology is high. He wants to stay in a good health, keep his hobbies and have regular contact to his grandchildren. Furthermore he sometimes in worried about Alberta, who suffered a stroke 5 years ago. She recovered very well but has to attend regular doctor appointments. Ernst thinks he could perhaps benefit from better information about the after-stroke complications and recommended prevention to better support his wife.

Within this use case a video communication solution was developed with the help of co-creation. For many seniors, digital technologies are a new field in which they have not gained much experience yet. As a result some are afraid of using them, to do something wrong or broken. With the help of UC-PT1-003, this fear should be overcome. The application is easy to use and very intuitively designed. Overcoming the fear can simultaneously increase self-confidence and competence in dealing with digital technologies. In addition, the seniors can enter into regular exchange with their families, friends or caregivers.

The use case comprises three objectives to achieve for the older individuals:

- overcoming the fear of digital technologies
- competent usage of technologies (e.g. receiving information)
- problem solving in the community.

Carus Consilium Sachsen GmbH (CCS) is the use case leader and Omnitor AB (OMN) replicated the use case.

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4.2 Description

This use case addresses older individuals living independently in rural or urban environments. They usually live alone or with their spouse and are visited or supervised by a family member or caregiver on a regular basis. The use case comprises three objectives to achieve for the older individuals.

To achieve the objectives, an easy to use digital solution is required that solves a frequent problem / need of the older individuals.

Older individuals might lack social interaction and communication with family and friends, which can lead to isolation and decreased well-being. A digital solution for video calls is an easy way to enable social interaction and communication. However, users might fear that calls are recorded, and their personal data is misused without their consent. Thus, we decided to provide a German video communication tool for older individuals to easily get in touch with their family and friends while ensuring data protection rights.

CCS has therefore implemented:

- video communication solution with friends and family

4.3 Digital solutions used in this use case

Video communication solution (MedSyn)

A web-based, no-install communication tool for e.g. the communication with their informal caregivers or family members/friends who are not close by/able to meet physically.

The video telephony can be used via the SHAPES App. For a successful connection, the friends/family/caregiver need to have a SHAPES account. The contact data of the respective persons is stored in the application, so that seniors can intuitively call their family via video and do not have to make any further settings. The sessions are not recorded, all privacy policies are respected. After the call, users can rate the quality of the call / connection / picture.

4.3.1 Digital solutions used for COVID-19 response

The use case itself and the video communication toll provides support in the daily lives of older people and remain them socially connected without meet physically. This is an advantage in the event of a pandemic.

Other special COVID-19 digital solutions are not included in UC-PT1-003.

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4.3.2 Equipment and devices used (from third parties)

The following additional hardware and software external device was used in UC-PT1-003:

- Tablet: Android Tablet (Samsung Galaxy S6 Lite)

4.4 Data plan

The data plan of UC003 is presented in Table 86. A complete version can be found in Annex 34.

Table 86: UC-PT1-003 data plan

Outcome
General data (i.e. data related with all pilot goals/covariates)
Caregiver data
Caregiver age
Caregiver highest educational degree
Caregiver spatial distance to care receiver
Internet-related variables with regard to care receiver
Access to device with internet connection at least twice a week (inclusion criteria; Yes/No)
Skilled to use internet (inclusion criteria assessed by referral of participants; Yes/No)
Frequency of internet use
Caregiving-related data
Type of care provided (Formal vs. informal)
Duration of care provision (in years)
Frequency of care provision (number of hours per week)
Existence of other care providers (Yes/No)
Relationship with the care receiver
Cohabitation with the care receiver (Yes/No)
Care receiver data
Care receiver age
Care receiver gender
Degree of dependence (subjectively evaluated by the informal caregiver)
Individual top three challenges
Use Case 3 (Overcome Digi Fear)
Number of use of video-call-solution

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Time of use of video-call-solution
Momentary state of satisfaction with (technical/practical) interaction (not with content)

4.4.1 Data capture methods to be used

A range of different data capture methods were used during the five phases of this pilot. More details can be found under the sections describing Phases 1 to 5.

4.4.2 Planning of evaluation

MAST

The MAST framework was used to evaluate the effectiveness and contribution of UC-UC-PT1-003 to quality of care. MAST is described as a multidisciplinary process that summarises and evaluates information about the medical, social, economic and ethical issues related to the use of telemedicine.

The Table 87 below contains the data required for the MAST evaluation.

Table 87: UC-PT1-003 Data required for MAST evaluation

MAST Domain	Topic	Outcome	Data required	Time point
Clinical Effectiveness	Mental health	OSSS-3 (social support) and life events		
	Effects on health-related quality of life	Health related quality of life and wellbeing	EQ-5D-5L-VAS; WHOQOL-BREF scores	Baseline, end of pilot
Patient perspectives	Satisfaction and acceptance	User acceptance	TAM scores	End of pilot
	Understanding of information Confidence (in the treatment) Ability to use the application	Usability of application	SUS scores 1-item health literacy	End of pilot

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	Access & Accessibility			
	Empowerment Self-efficacy	User engagement	Number video calls	End of pilot
		Self-efficacy	SHAPES Participation questionnaire	During pilot
			GSES (Self-efficacy)	Baseline, end of pilot
Economic aspects	Amount of resources used when delivering the application and comparators	Cost of devices	Cost as per device purchasing invoice	End of pilot
		Cost of using digital solutions and SHAPES platform	Costs to be provided by SHAPES	End of pilot
		Cost of staffing	Timesheets and costing data	End of pilot

MAFEIP

Due to the small size of the pilot, the data needed to be input into the Monitoring and Assessment Framework for the European Innovation Partnership on Active and Healthy Ageing (MAFEIP) tool are likely to be biased and, therefore, the MAFEIP was not used to evaluate UC-PT1-003.

4.4.2.1 Final check of the use case by using the CSFs of MOMENTUM and the NASSS framework

MOMENTUM

The MOMENTUM blueprint was applied to check if UC-PT1-003 had the critical success factors (CSFs) needed to take it from the pilot phase to large-scale deployment. A complete version can be found in Annex 35. Details of each CSF are provided below.

CSF 1. Cultural readiness for the telemedicine service

According to interviews in mock-ups, participants of PT1 are willing to share behavioural and medical data with them. Patients usually accept new technologies as far as they have a clear benefit.

The participants already use digital solutions in their daily life and often show a medium to high digital literacy. Even participants with less digital knowledge are aware of the potential benefits that digital solutions can offer.

CSF 2. Advantages of telemedicine in meeting compelling need(s)

In order to reduce loneliness and improve the autonomous lifestyle of older people, tools that support the users are needed. Tools like the video telephony can ensure that the older persons stay socially connected, as they overcome the barrier of physical distance. With the help of SHAPES digital solution, they can connect with family and friends in an easy and safe way.

CSF 3. Ensure leadership through a champion.

The technical partner MedSyn already has experience in the field of developing video consultation solutions. The UC Lead CCS is also experienced in the use as well as the training of users of video telephony solutions. CCS is one of the leading consultancies and network companies in the region in the field of healthcare. In addition, the replicating partner OMN also has expertise in the field of video telephony.

CSF 4. Involvement of health care professionals and decision-makers

The deployment of this use case did not foresee any participation of health care professionals and thus they have not been involved in the development.

CSF 5. Put the patient at the centre of the service

The participants have been involved in mock-up presentations in phase 2, hands-on training in phase 3 and the large scale pilot in phase 5.

The objectives of the use case are to overcome the fear of using digital technologies in order to increase self-confidence and working competence with technology. Furthermore, loneliness can be decreased, as the older people can stay connected with family and friends.

Due to the cooperation with the participants and getting their feedback, it was possible to further develop the digital solutions and adjust them to the individual needs of the older persons.

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CSF 6. Ensure that the technology is user-friendly

It is the objective and great effort is done within the SHAPES consortium to define requirements to present the technologies of UC003 as user friendly as possible to older persons. The visual design, but also the operation of the digital solutions were adapted to the needs of older persons. The handling should be as intuitive as possible. To ensure this, participants were involved in different phases (see CSF 5).

CSF 7. Pull together the resources needed for deployment

The resources required for deployment of the digital solutions for the pilot were available thanks to SHAPES funding and internal resources already allocated. The technical partners of the use case provided all IT competences.

CSF 8. Address the needs of the primary client(s)

Older people/families were potential clients. The solution was used as a tool (for caregivers) to promote social activity. It can enhance the security feeling of the care-receiver, as well as for the caregiver.

Healthcare providers are potential customers. The ability to care for individual seniors may allow more individualized therapy and faster therapy changes, once a decrease in any physical concerns is detected.

CSF 9. Prepare and implement a business plan

A business plan for the solution was developed in D7.3 SHAPES Business Plan WP7.

CSF 10. Prepare and implement a change management plan

It will be evaluated after the end of the project.

CSF 11. Assess the conditions under which the service is legal

Completing a Data Protection Impact Assessment (DPIA) identified and minimized any risks associated with the pilot with input sought from other WP and the SHAPES Data Protection Officer at CCS. Data processing agreements has been established with relevant partners to permit access to anonymised and pseudonymized data.

The assessment of the conditions under which the service is legal was reviewed. As this digital solution is not a medical device, the requirements do not need to be considered.

CSF 12. Guarantee that the technology has the potential for scale-up

Although the participants in the pilot are limited, the solution is being designed to scale it to a pan-European level. The video telephony has the potential for scale-up as it is

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a cheap and user-friendly technology that runs on the web and uses a commercial and well-disseminated input device.

CSF 13. Identify and apply relevant legal and security guidelines

General Data Protection Regulation (GDPR) has been applied. The system provided implements all security and privacy related regulations.

CSF 14. Involve legal and security experts

We are working with SHAPES partners (for example with LAUREA, with extensive expertise in this field), VICOM was awarded the ISO 27001 certification for information security management. HMU and VICOM have extensive expertise in IT infrastructure security.

CSF 15. Ensure that telemedicine doers and users are privacy aware

CCS employees have already been working with data protection protocols. They have also been instructed in the use of data protection with the new technologies being introduced in the pilot project. Older people and informal carers were informed about the data collection and processing and their consent was obtained.

CSF 16. Ensure that the information technology infrastructure and eHealth infrastructure are available

We understand that the IT infrastructure for deployment of the technology is being provided through the SHAPES platform. An appropriate infrastructure for deployment of the digital solutions within the organisation was in place for the pilot.

CSF 17. Put in place the technology and processes needed to monitor the service

With support from WP4 and WP5 partners, a system to monitor the pilot was set up. Local IT and community support was also available to help address minor issues with the use of the digital solutions. A system to monitor and mitigate incidences was established. It was impossible to predict any incident that may occur in a project. It was more appropriate to assess the relative risks of certain incidences and have an appropriate plan in place for mitigating and managing incidents. The local project team and community support officers were available to support participants in resolving any doubts they experienced with the digital solution.

CSF 18. Establish and maintain good procurement processes

Standard local procedures which comply with all of the requisite regulations have been followed for procurement of devices.

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NASSS

The NASSS framework was used to detect areas of complexity in the project plan for piloting UC003. The short version of the NASSS-CAT questionnaire was considered and completed by the pilot team (see Annex 4). At the time the NASSS framework was applied, of the seven domains, there were two domains ('Technology', 'Intended adopters' and 'value proposition') in which significant complexities were identified that, if not mitigated or addressed, were likely to affect the project's success at the piloting stage of the use case.

Complexities were identified in other domains, however these were related to a larger scale implementation and deployment of the use case into practice and so were not considered to be relevant at this stage of the project. They provided a useful basis for further exploratory research.

Table 88 gives an overview of the complexities and mitigation issues defined.

Table 88: UC-PT1-003 Complexities and mitigation measures identified using the NASSS framework

NASSS complexity domain	Uncertainties detected	Mitigation measures taken
Technology	The communication with MedSyn server is not fully working yet	Meetings with MedSyn are being conducted to define the communication protocol , 2 weeks meetings
Technology	The exact role and functionality of the platform had not yet been defined/communicated to the use case leaders	Cross WP alignment meeting set up between WP leads and pilot leaders to discuss data flow and functionality of the SHAPES platform
Technology	Many interdependencies was developed. Bugs and crashes are expected. Resources are allocated.	Constant check and support contact person is needed to keep developing times.
Intended adopters	Level of digital literacy in the intended participant population. As a minimum requirement service, users need to	User experience evaluation with the aim to capture how well the technology is accepted by participants.

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	have WIFI already installed in their home	
Value proposition	Positive effects are difficult to measure.	User experience evaluation with the aim to capture how well the technology is accepted by participants and caregivers; by interview, survey after using the technology, SUS Score

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4.5 Phase 1

The first phase of the pilot campaign intended the development of a realistic scenario for each use case. These scenarios are based on the People-Activities-Context-Technology (PACT) framework and Function and events, Interactions and usability issues, Content and Structure, Style and aesthetics approach (FICS).

4.5.1 PACT and FICS Scenario

Table 89: UC-PT1-003 PACT scenario

Code	**UC-PT1-003** Version **0.2** Date **2022/01/04**
Applicable SHAPES Persona	Ernst (P1), Roberto (P2), Ayesha (P3), Isabelle and Marco (P4, especially needs of care giver), Helena (P7)
Applicable SHAPES use case	UC-PT1-003 Overcoming the fear of digital technologies – competent usage of technologies – problem-solving in the community
Point of contact (pilot site)	Carus Consilium Sachsen GmbH
Point of contact (technical provider)	MedicalSyn GmbH (MedSyn)
People Roles and/or actors of typical users involved in delivering and receiving the telemedicine intervention	• Older people, 65+ years, care recipient, living independently in their own home in rural or urban environments. They usually live alone or with their spouse and are visited or supervised by a family member or caregiver on a regular basis. They will have non to average level e-literacy and in some cases access to smart phone, laptop or PC. • Care giver: most likely relative(s), will have an average to high level of e-literacy and access to a smart phone, laptop or PC.
Activities Activities to be performed by the actors in order to successfully provide and receive the telemedicine intervention	**Older people / care receiver** • Use video-call-solution on a regular basis • Answer satisfaction survey for direct satisfaction assessment with regards to video-call-solution **Care giver** • Use video-call-solution on a regular basis • Answer satisfaction survey for direct satisfaction assessment with regards to video-call-solution

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procedures for the professional and the patient; Parameters that determine the measures used in the intervention	

Context
 	
Social-medical relevance of the telemedicine intervention; privacy issues; risks for the patient; locations
	• Pilot participants are provided with the necessary devices (if needed) and access to the video communication solution. Family members and friends of pilot participants are provided with access to the video communication solution, too.
	• The use case comprises three objectives to achieve for the older individuals:
	  ○ overcoming the fear of digital technologies
	  ○ competent usage of technologies (e.g. receiving information)
	  ○ problem-solving in the community
	  To achieve these objectives, we provide a German video communication tool for older individuals to easily get in touch with their family and friends while ensuring data protection rights.
	• Maintaining privacy of data is of the utmost importance. An identification list (including name and date of birth) will be held at the local pilot site.
	• GDPR and ethics in line with WP8
	• Data and servers must be located within the EU
	• German language
	• Location: Saxony, Germany

Scenario	<u>Older person:</u> Ernst is 75 years old, a recently retired former teacher from a college. He lives with his wife Alberta in a small town in their family home with a garden. Ernst loves to sing in the church choir and regularly does volunteer work for the local church charity. He and Alberta go once weekly to an older adults dancing club. They also love travelling – every year they go on a foreign holiday. Ernst is in very good health He exercises every day for 30 minutes in the morning. He likes to try new types of exercises according to his actual problems (usually slight knee pain or

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	back pain) and often takes longer walks. Ernst sometimes worries about Alberta, who suffered a stroke 5 years ago and although she recovered very well, she has to go to regular medical check-ups every 6 months, and he is always worried about the results. Together they enjoy doing the cognitive training exercises from the bool Alberta got from her doctor. Ernst and his wife have been using the SHAPES platform for some time to get help and support in everyday life. Among other things, they use the video telephony module to stay in visual contact with their two sons and grandchildren or to quickly solve problems in the community/community. Every two days, Ernst and his wife Alberta make video calls to one of their two sons. Same today, they made an appointment to meet one of them at 7:00 p.m. At 7:00 p.m., both seniors are already in the living room when their tablet gets a notification to indicate an incoming video call. Operating the tablet is no longer a challenge for either of the seniors. Thanks to numerous tutorials, instructions in various forms and an assigned contact person via a support hotline, both seniors quickly and easily got used to using it. Ernst accepts the video call, the connection is established, and the grandchildren can be seen. Both sides exchange information. Such a call usually takes at least half an hour. For Ernst and Alberta, this is a good opportunity to participate in the lives of their grandchildren. Even during the COVID 19 pandemic, both sides were still able to see each other regularly and maintain close contact. <u>Caregiver / relatives:</u> Both of Ernst's sons use the SHAPES App and have a so-called Caregiver access. Among other things, they can use this to view their father's data, receive the recommendations that are given to the senior during the day and, in an emergency, receive an alert if an unusual situation arises. They also use video telephony via the SHAPES platform. Both sons phone their father every 2 days. Both sons are happy because they can get an idea of their parents' state of health not only acoustically but also visually. In addition, it

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	serves communication and participation in the life of the other.

Technology
 	
Type of information / parameter that are relevant in monitoring the health status; type and frequency of accessibility of information; feedback modalities (communication***)***
	Older people / care receiver
	• Age (year not Date of Birth)
	• Gender (m/f/d)
	• Degree of dependence
	• Individual top three daily / common challenges
	• Internet-related variables
	  ○ Access to device with internet connection at least twice a week (inclusion criteria; Yes/No)
	  ○ Skilled in using internet (inclusion criteria assessed by referral of participants; Yes/No)
	  ○ Frequency of internet use
	
	Care giver
	• Age
	• Highest educational degree
	• Spatial distance to care receiver
	
	Caregiving-related data
	• Type of care provided (Formal vs. informal)
	• Duration of care provision (in years)
	• Frequency of care provision (number of hours per week)
	• Existence of other care providers (Yes/No)
	• Relationship with the care receiver
	• Cohabitation with the care receiver (Yes/No)
	
	Video-call-solution
	• Number of use of video-call-solution
	• Time of use of video-call-solution
	• Momentary state of satisfaction with (technical/practical) interaction (not with content)
	
	In addition, see the data plan.

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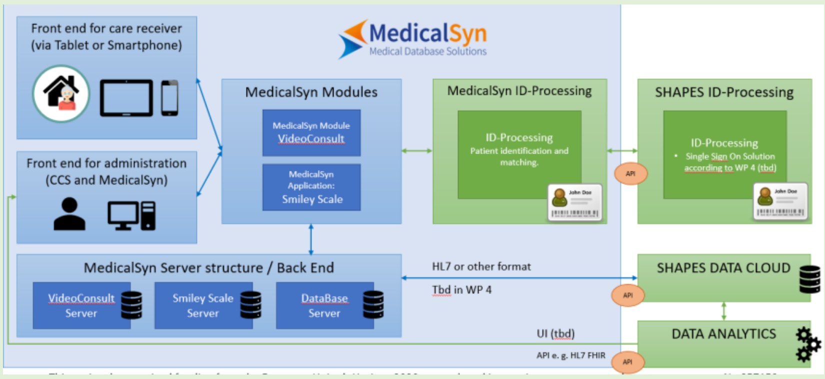
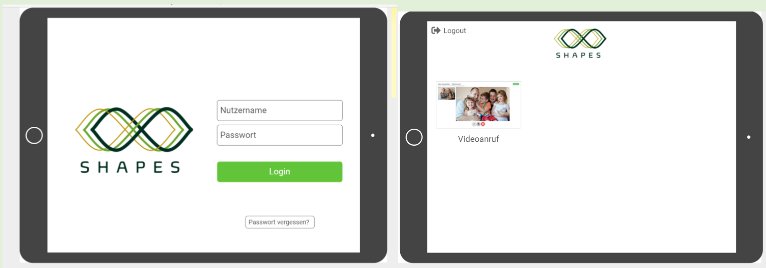
Table 90: UC-PT1-003 FICS scenario

Function and events ***Functionality of the intended system, which is capable to realise actors' activities***	The system will offer for care receiver and for caregiver a functional German video-call-solution. The German video communication tool is provided for older individuals to get easy in touch with their family and friends while ensuring data protection rights. Pilot participants are provided with the necessary devices (if needed) and access to the video communication solution. Family members and friends of pilot participants are provided with access to the video communication solution, too. Measurement: • Number of use of video-call-solution • Time of use of video-call-solution • Momentary state of satisfaction with (technical/practical) interaction (not with content)
Interactions and usability issues ***User-system or system-component interactions meditating actor's activities; Types of the interactions, e.g. unidirectional data streaming service or reliable messaging service***	In this use case, we expect to have two users: - Older person - Care giver – most likely relatives There will be two front ends – one for the older person and one for the care giver, depending on the login. Both can start the solution by activating the Video call button/icon, and with the help of an address book they will select one contact to get in touch by the video-call. About a notification you will notice the call and you can get it. After the call, you will answer some short questions about the satisfaction about the video-call solution.
Content and structure ***Variables of the interaction***	The older person's front-end will be on an Android tablet. The interaction will use the touch-screen interface. Data will be sent automatically from the sensors to the tablet. The caregivers will interface through SHAPES Android App. The following image represents the content and structure built to support this use case.

	  The SHAPES Front-end App delivers single centralised access to the different digital solutions and their provided functionalities. Each functionality is then provided by the respective digital solution, enabling the user to visualise all the relevant information concerning the specific functionality and to interact with the solutions
Style and aesthetics ***Look and feel of the system***	The technological solution supporting the use case adopted a "look and feel" inspired in the SHAPES project identity, namely its logo, colours and the use of photos. As a result, the digital solutions present the SHAPES logo and the logo of the partner organising the use case pilot; they also use green and golden tones and the national language of the use case pilot participants. Following the SHAPES UX guidelines (Deliverable D5.1), the digital solution presents a simple and straightforward language and a friendly, easy-to-use navigation scheme. The following images exemplify the style and aesthetics of the different digital solutions supporting the use case.

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	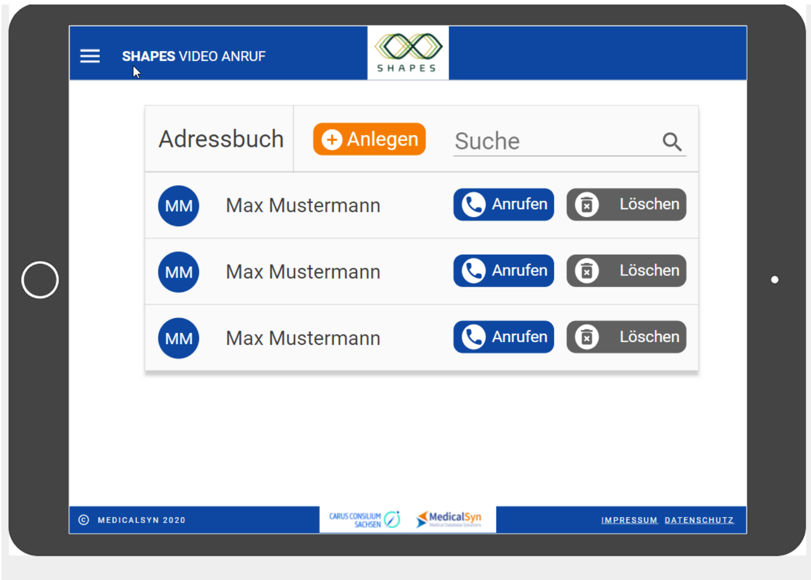 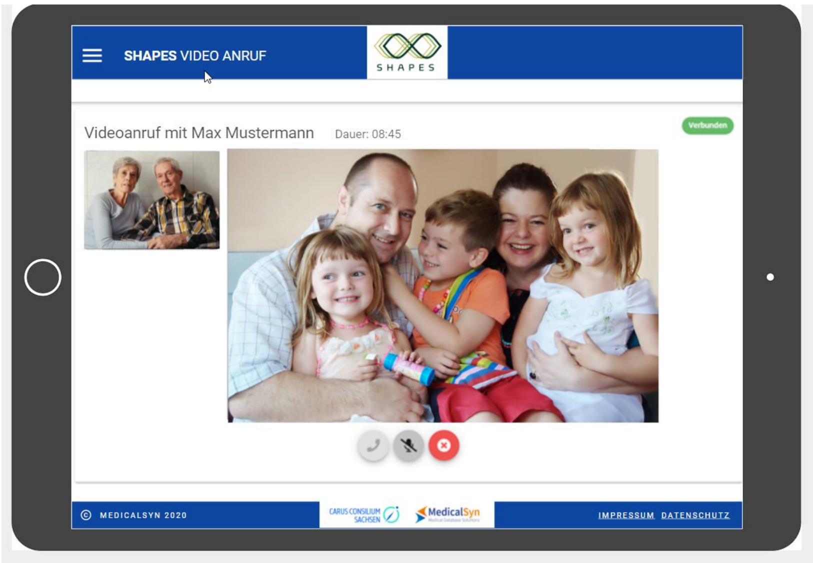

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4.5.2 Key performance indicators

Key Performance Indicators (KPIs) are defined as a set of measures that focus on the factors most critical to a project's success. KPIs are measurable and quantifiable with a target or threshold. They measure a performance in critical areas by showing the progress or lack of it towards realising the objectives of each specific use case. The following KPIs have been chosen to determine whether, or not, the pilot for UC-UC-PT1-003 has been successful.

Failure to meet four or more of the KPIs indicates that repetition or major revisions to the use case and associated digital solutions are needed before entering further development oriented to commercialisation.

KPIs

The base of the evaluation is the German school grading system; 1 = very good/excellent, 2 = good, 3 = sufficient, 4 = poor, 5 = insufficient. Grade 3 should always be achieved.

Table 91: UC-PT1-003 KPIs Overview

school grading system / grade 3 should always be achieved = KPI (min.)

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		1 = excellent		2 = good		3 = sufficient		4 = poor		5 = insufficient
UC-PT1-003 KPI for phase 5		complies with		complies with		complies with		complies with		complies with
KPI 1: successful participant recruitment (target 10 participants)	1	10	2	9-8	3	7-6	4	5-4	5	< 4
KPI 2: How many recruited participants remained enrolled in the pilot until the end?	1	10	2	9-8	3	7-6	4	5-4	5	< 4
KPI 3: How many % of the participants carried out the video call solution at least 1 x during phase 5?	1	100%	2	<100-80%	3	<80-60%	4	<60-45%	5	<45%
KPI 4: How many % of the participants have carried out the video call	1	100-80%	2	<80-50%	3	<50-30%	4	<30-10%	5	<10%

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solution several times during phase 5?									
KPI 5: How many % of the connections were rated at least as sufficient?	1	100-80%	2	<80-60%	3	<60-50%	4	<50-40%	5	<40%
KPI 6: How many % of all support cases during the test phase are serious cases? What are serious support cases? - System crash, user cannot log in, system does not collect data, support from/with technical partners necessary, …	1	5%	2	>5%-10%	3	>10%-15%	4	>15%-20%	5	>20%
KPI 7: SUS Score (System	1	Best Imaginable (100%)	2	Excellent (>80%)	3	Good (80-60%)	4	Poor (<60%)	5	Worst Imaginable (<15%)

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Usability Scale)										
KPI 8: How many % of the participants are willing to use the digital solutions after the test phase?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 9: In general, how many % of the participants feel that it would be useful to develop a specific platform for healthy ageing?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
Summary						At least 70% of the KPIs must be met for the UC to be successful.				

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4.5.3 Timeline of pilot activities

The original timeline of pilot activities, according to the Description of Work was to conduct Phase 1, 2 and 3 between May 2020 and July 2021, then Phase 4 (deployment in controlled environment) in September 2021-April 2022 and Phase 5 between May 2022 and March 2023.

Due to the onset of the COVID 19 pandemic and the related changes in the work situation, as well as the severely limited opportunities for contact with senior citizens, the first phases 1-3 in particular were delayed in some places by up to 4 months. Also relevant here are the technological challenges that arose during the development process. Overall, it was possible to reduce the delays of the first phases somewhat by streamlining phases 4 and 5, so that it was possible to postpone the completion of the pilot by 2 months from April 2023 to June 2023.(Table 92)

Table 92: UC-PT1-003 Timeline

Task 6.2: Pilot Theme 1: Smart Living Environment for Healthy Ageing at Home			
UC-PT1-003: Overcoming the fear of digital technologies – competent usage of technologies – problem solving in the community			
Months		***original amendment***	***real timeline***
Nov 19	**1**	start of SHAPES	
Dez 19	**2**		
Jan 20	**3**		
Feb 20	**4**		
Mrz 20	**5**		
Apr 20	**6**		
Mai 20	**7**	phase 1	phase 1
Jun 20	**8**		
Jul 20	**9**		
Aug 20	**10**	phase 2	
Sep 20	**11**		

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Okt 20	12		
Nov 20	13		
Dez 20	14		phase 2
Jan 21	15		
Feb 21	16	phase 3	
Mrz 21	17		
Apr 21	18		
Mai 21	19		
Jun 21	20		
Jul 21	21	**ID**	
Aug 21	22	phase 4	
Sep 21	23		phase 3
Okt 21	24		
Nov 21	25		
Dez 21	26		
Jan 22	27		
Feb 22	28		
Mrz 22	29		
Apr 22	30		
Mai 22	31	phase 5	**ID**
Jun 22	32		phase 4
Jul 22	33		

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Aug 22	**34**		
Sep 22	**35**		
Okt 22	**36**		
Nov 22	**37**		
Dez 22	**38**		
Jan 23	**39**		phase 5
Feb 23	**40**		
Mrz 23	**41**		
Apr 23	**42**	**D**	
Mai 23	**43**		
Jun 23	**44**		**D**
Jul 23	**45**		
Aug 23	**46**		
Sep 23	**47**		
Okt 23	**48**	end of SHAPES	

4.6 Phase 2: Testing of mock-ups and prototypes

4.6.1 Methodology of testing

Aim

The aim of the mock-ups is to validate the functionalities of technologies in UC-PT1-003 and the way they are planned to be implemented, including the interaction with the users, based on the feedback provided by users. In addition, it aims to collect new functionalities. The outcome of this mock-up session provided technical partners the opportunity to integrate user feedback at an early stage of the technological development process.

Method

To achieve the goal, previously recruited participants were invited to meetings (mock-ups). The appointments with the 18 seniors were conducted in presence, observing and fulfilling all the required Corona requirements. Six appointments, two hours each, took place. The seniors were divided into small groups of three to four participants. The composition of the groups was determined by the digital literacy of the individual participants. A differentiation was made between "no digital literacy" (no experience at all in dealing with digital technologies), "medium level" (already had experience) and "high level" (already has a lot of knowledge in the area of digitization). In order to create a feel-good atmosphere and an open culture of discussion, participants with similar levels of digital literacy were divided into groups. That ensures that no one was afraid to get involved in the discussion due to their (lack of) knowledge and openly communicate their ideas, suggestions and questions. Furthermore small breaks were made, coffee and cake were provided and last but not least the participants received a goodie-bag. The Phase 2 mock-up presentations with recruited participants were conducted between 28th June 2021 and 13rd July 2021.

Figure 18: UC-PT1-003 Mock-up session, creating a good atmosphere

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Figure 19: UC-PT1-003 Mock-up session documents for participants

A PowerPoint presentation was shown in the beginning. The participants were getting a brief background information about the SHAPES project and an overview of the purpose and features of the PT1–UC003 digital solutions. Mock-ups, e.g., visual images of all the types of screens a patient is likely to encounter when using the App, were presented to the participants. MedSyn additionally developed a short demo version for better comprehensibility. In this way, the participants could be shown more practically how the application works.

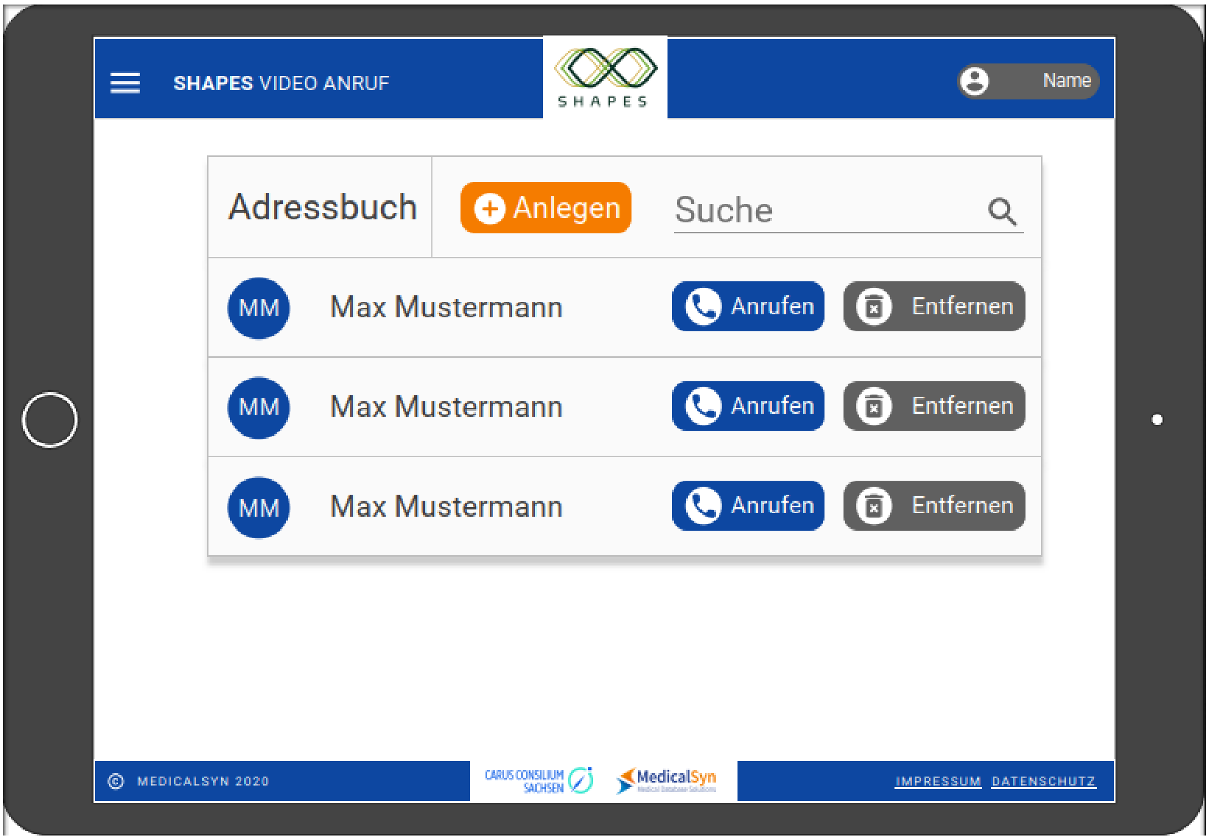

Figure 20: UC-PT1-003 Mock-up Video communication tool MedSyn

The senior's assessment was captured using two methods. Firstly, a project manager observed the participants' reactions during the presentation and noted down their comments and criticisms for later evaluation. Secondly, the participants were given a questionnaire to complete at home. The questionnaire included the following categories:

- Perception and comprehension – the participant understands the information transmitted, the necessity/advantages of using the digital solution
- Interaction, intuition and function – the participant is able to find the desired information or complete his task without any previous knowledge or experience regarding the presentation or structure of the information offered
- Appearance and layout – the participant is able to recognize all symbols/icons, understandable/clear design of the digital solution
- General feedback – the participant should evaluate the usefulness of the application and name suggestions for the improvement to make the digital solution more user-friendly
- Experiences – the participant should report on their previous experiences with digital technologies.

Questions were guided by the standard ISO 14915, which specifies four principles for the design of multimedia applications. The principles are:

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- Suitability for the communication objective — the presentation of the information is suitable for achieving the goals of the providers and visitors.
- Suitability for perception and understanding — the information transmitted is easy to understand and can be easily recorded.
- Suitability for exploration — the participant is able to find the desired information or complete his task without any previous knowledge or experience regarding the presentation or structure of the information offered.
- Suitability for user motivation — a participant must be encouraged to act. By focusing on the needs of the participants, an appealing presentation and goal-oriented guidance, the participant can be motivated.

Informed consent procedure

Eligible target users were provided with a participant information sheet (see Annex 5) explaining the background and purpose of the study and what they can expect to happen if they agree to participate. Those who agreed to take part were given a consent form (see Annex 6) and data security information (Annex 7). Signed consent forms and contact details were provided to the pilot leader to proceed with the study activities.

Informed consent for all participants were taken with the following accepted forms of signatures:

- Physical handwritten signature
- An electronic representation of a handwritten signature

The informed consent signed by participants was signed by the SHAPES manager at CCS to acknowledge reception and a physical or electronic copy of the document was provided to the participants by personnel of CCS.

The consent process collected the following personnel:

- Name: in the consent form, for the purpose of identification of the accepted consent.
- Email (optional): if the signed consent form is sent to CCS by email, the same email was used to return a countersigned copy. Afterwards, the email was deleted for all other purposes of this pilot
- Address (optional): the participant may provide a physical address to receive the countersigned copy of the consent form. Afterwards, the address details were deleted for all other purposes of this pilot

4.6.2 Results of testing

Table 93: UC-PT1-003 Mock-up sessions, results from the interviews

Results from the interviews

a) Perception and comprehension – the participant understands the information transmitted, the necessity/advantages of using the digital solution
The participants see the solution primarily as a way to stay in touch with friends or family, but also to call a doctor. Only three of the interviewed participants could not yet imagine anything about the solution. The participants liked the fact that they could see the other person and thus their reaction. They also liked that the solution is easy to use and practical. They criticised the fact that video telephony already exists, and that the person called must also have the SHAPES App or this special application.
b) Interaction, intuition and function – the participant is able to find the desired information or complete his task without any previous knowledge or experience regarding the presentation or structure of the information offered
For the questions on interaction / intuition / function, it was often the case that the participants were not yet able to give an answer at this point. Some said that they could imagine accessing the solution with the help of people they know or through training. Others could imagine accessing the solution without help. The process was comprehensible to some from the beginning, and they believed they could find certain information on their own, others gave no answer. Most people had no concerns about the solution, which could mean that video telephony is suitable for senior citizens to **overcome their fear of technical solutions and a competent usage of the technology.**
c) Design and layout – the participant is able to recognize all symbols/icons, understandable/clear design of the digital solution
Overall the participants rated the layout and design as attractive and good overall.
d) General feedback – the participant should evaluate the usefulness of the application and name suggestions for the improvement, to make the digital solution more user-friendly
The video communication was evaluated as useful, especially to stay in contact with the community. Thus, the solution has the potential to achieve the goal of **solving problems in the community.**
e) Experiences – the participant should report on their previous experiences with digital technologies.
The majority of participants had already tried similar solutions and had experience with video communication tools.

Overall the video communication tool was perceived as very positive by the participants. They especially emphasized that it was a good way to stay in touch with friends and family. Moreover, it would provide a parameter for observing the visible change of seniors. Accordingly, it was noted that it would be useful to have regular meetings with the responsible family doctor through this application.

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Participants with little knowledge and experience about digital technologies also estimated that it was easy to use. They emphasized that they would probably only need a short briefing and could use the application confidently afterwards. The planned design was understandable for the majority. Through the interviews it already became clear that the solution has great potential to achieve the intended goals of the use case. The entire results of the questionnaires can be seen in the Annex 36.

4.7 Phase 3: Hands-on Experiments

4.7.1 Methodology of hands-on experiments

Aim

To collect feedback (user experience) from end-users by giving them the option to try the video telephony to be deployed in the use case PT1-003 in a prototype version.

Overview

Participants (older people, aged 65 years old and over) were invited to sessions with CCS personnel to take part in the hands-on experiments. The sessions have been face-to-face. With users a group session with three to five participants was organised. The design was similar to the mock-up sessions.

Participants

Phase 3 hands-on experiments was conducted with 17 participants (i.e., ≥ 65 years' old). Gender equality have been sought in the group of older person participants.

Informed consent for all participants was taken with the following format of signatures collected where appropriate:

- Typewritten
- An electronic representation of a handwritten signature
- Handwritten signature

Method

Before hands-on training with participants, personnel of CCS performed some tests of the different functionalities. The Phase 3 hands-on experiments with recruited participants were conducted between 15th February 2022 and 28th February 2022.

Hands-on training at CCS

The video telephony was presented as a functioning prototype. The SHAPES project manager at CCS guided the participant steps and tasks to demonstrate a video call. Instructions were given with the support of a presentation projected on a laptop screen or similar.

First, we discussed together with the participants which solutions / topics were presented in the last meeting (mock-up). Changes during the last seven months were explained in order to optimally integrate the participants into the development process and to increase the understanding of the complexity of a digital solution.

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The participants were shown what the user interface looks like and how to start a video call. For this purpose, the CCS staff was distributed in two different rooms. The participants stayed with one of the employees. This staff member instructed them and called the other staff member via the user interface. During the call, functions such as "mute" or "turn off video" were explained. The participants tested this immediately. This quickly emphasizes how simple, user-friendly and intuitive the handling of video telephony is. The pace of the session was determined by the participants. They could ask questions or asked for breaks at any time.

Figure 21: UC-PT1-003 Hands-on session

Feedback have been collected at any time of the session by the project manager of CCS. A concurrent 'think out loud' approach was used to collect reactions to the video telephony. The participants were encouraged to verbalise their reactions, thoughts, feelings, and opinions about the prototype throughout their engagement with the presenter. Notes have been taken by the presenter.

Data analysis

A completed report, including practical recommendations, was presented to and discussed with technical partners and replicating sites.

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4.7.2 Results of the hands-on experiments

During the test, all participants were very interested. A total of 10 participants filled out the questionnaire. The feedback was similar to that in phase 2 (see chapter 4.6.2). The following further improvements were mentioned by the participants:

- As a possibility for improvement, the function of screen sharing was suggested. This would make it easier to communicate with friends and family (e.g. show pictures).
- Voice control would also be an additional advantage.
- Furthermore, the possibility of a group consultation /chat was mentioned to involve more family members or friends.

Results from the interviews can be found in Annex 37. Notes taken during the session can be seen in the Annex 9.

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4.8 Phase 4: Small Scale Live Demonstration

4.8.1 Recruitment of participants

Initially, it was planned to go through the phase with the participants of the previous phases. From the experience of other projects, CCS has learned that testing digital solutions in advance by CCS staff is useful to identify problems or technical errors. Therefore, CCS has tested the platform as well as the devices internally. In addition, the test phase was used as a basis for preparing user manuals for phase 5 for the participants. In total, three project staff members from CCS were involved in the test.

4.8.2 Technical aspects & Logistics

Validations

The three CCS employees tested the solution from different perspectives, once from the caller's point of view and once from the called person's point of view to validate necessary aspects of the digital solution.

Training

Users were trained into the use of video telephony. User manuals have been given to the users for reference. The user manuals can be found in Annex 38. Users got the contact telephone number of the project manager at CCS and were encouraged to call for any issue.

4.8.3 Roles and Responsibilities

CCS personnel was responsible for the set up and training process. SHAPES project manager was the contact point of participants for any technical issues. All technical problems were reported to the MedicalSyn-led technical team, which took action as needed. All face-to-face visits required to resolve technical issues were conducted by CCS staff.

4.8.4 Ethical considerations

An ethical self-assessment for phases 1–5 of this use case has been completed.

Data Protection Impact Assessment (DPIA) was finished before the start of the pilot (including the data risk assessment).

Data Processing Agreements were finished before the start of the data collection. CCS is the data controller and, as such has access to the full dataset. Data Processing Agreements were in place to facilitate the sharing of pseudonymised data with specific SHAPES partners for specific purposes.

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An ethical approval was not necessary in phase 4 because of the internal test.

4.8.5 Outcome of the Small-Scale Live Demonstration

The application was tested by CCS staff with the help of a test protocol (Annex 39). The feedback after the first test was very positive. All functions listed in Table 94 below were possible. The procedure was very logical and understandable. A secure and high-quality connection was established between the test persons. The picture and sound quality was very good.

Table 94: UC-PT1-003 phase 4 test protocol

Functions	Outcome
After successful login, the address book opens.	Works as described
A contact can be selected in the address book and video telephony is opened by selecting it via the blue telephone button.	Works as described
The symbol of the telephone handset of the called subscriber turns green.	Works as described
The connection is established by clicking on the green telephone receiver.	Works as described
The green handset symbol is the sign/notification that a call is being made. The symbol changes colour.	Works as described
During the first video telephony, you are asked whether the camera and microphone can be accessed during the connection. If confirmed, a connection is established. If you refuse, no connection is established.	Works as described
Telephone call with video can be made	Works as described
The connection is terminated by clicking on the red button with the cross.	Works as described

The following suggestions for improvement were forwarded to the technical partner:

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- Evaluation of the quality of the video call (implemented after feedback from phase 4)
- Integration with Shapes App (not implemented due to technical implementation problems)

Figure 22: UC-PT1-003 phase 4 CCS staff while testing video telephony

In addition, an evaluation of video communication solution took place with the help of the System Usability Scale (SUS). The three CCS employees rated the solution with a score between 92.5 and 97.5. The average of the overall rating was 95.3. This shows a very high usability without problems. The evaluation according to SUS can be found in Annex 40.

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SUS - Overall score UC003	
Participant	Score per participant
CCS 1	92,5
CCS 2	97,5
CCS 3	97,5
Average score	**95,83333333**
SD	**2,357022604**
Med	**97,5**

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4.9 Phase 5: Large-scale pilot activity

Implementing the SHAPES large-scale (Pan-European) pilot campaign aims to validate the SHAPES capabilities and benefits to care recipients, caregivers and care service providers across different regions, cultures and health and care organizational models. It also aims to assess the impact of the SHAPES in supporting healthy ageing and independent living and the definition of improved integrated care policies and measures.

In phase 5, a pilot test with an optional qualitative interview component was conducted. The phase 5 pilot test aimed to determine the effectiveness of using the SHAPES platform and devices in order to increase the senior's wellbeing. Specifically, the "video communication" solution should be tested and evaluated to find out if the solution contributes to

- overcoming the fear of digital technologies;
- competent usage of technologies (e.g. receiving information) :
- problem solving in the community.

The pilot's objective was to recruit 10 participants at the CCS lead pilot site. The period of intervention was set for 8 weeks in the individual homes of the participants. The pilot was replicated by Omnitor (OMN) from Sweden with 24 participants.

The study was evaluated at the beginning and end of phase 5. An evaluation after three months was not possible because the previous phases and thus phase 5 were delayed (see 4.5.3 timeline pilot activities).

4.9.1 Recruitment

With regard to the evaluation of digital solutions, a sample size of 15 participants was targeted for this pilot study. This sample size was chosen pragmatically beforehand to be as representative as possible of the target population, large enough to provide valid responses and within the resources available. Due to the high time and effort required to supervise the participants in phase 5, the target was reduced to a total of 10 participants. In addition, two care givers and two researchers have been recruited in phase 5. The recruited care receivers (nine in total) were between 68 and 83 years old and live either alone or with a partner independently in their own home. They are all self-sufficient. In addition, the participants have different technical skills, from little experience with technology to high technical affinity. The caregivers are 33 and 41 years old and are not related to the participants. Both have experience with technical solutions for the ageing population in the home environment.

No new participants were recruited for the pilot activity of UC-PT1-003, besides researchers and care givers. The seniors from phase 2 and 3 continued to be part of the project and participated in the development process. In this way, continuity was

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ensured. As the participants followed the development from the beginning, the co-creation approach could be used to further improve and adapt the digital technologies. In addition, a consistent group of participants increased efficiency as they already knew each other and the cooperation with the CCS worked well. The seniors were already familiar with the functions and challenges of the digital technologies developed in the project.

CCS performed several recruitment activities to create awareness for the project and to find suitable pilot participants for the testing. The following steps were taken by CCS to recruit participants for the pilot activities:

- Invitation of senior citizens to the information event “senior citizen café” through a newspaper advertisement;
- Newspaper advertisement in a free regional newspaper (“Wochenkurier”);
- Presentation to participants from other CCS projects (HoCare2.0, GATEKEEPER);
- Recruitment in the context of CCS public relations (CCS newsletter, LinkedIn, Xing, CCS website);
- Recruitment in the personal environment of CCS employees.
- Enquiry with the pilot participants who have already taken part in the CCS lead pilot site

First communication about the pilot has been conducted via senior citizen event from the research team to present all relevant information and answer questions from the potential participants. Afterwards information sheets and consent forms were sent out to eligible participants in case they still showed interest in the study.

Eligibility criteria

Inclusion criteria:

- person aged 65 years old or older at the time of recruitment
- living in Dresden and the surrounding area (radius < 50km)
- living on their own or with a partner (cohabitation, marriage)
- self-reported capacity to use the App installed on the tablet
- self-reported capacity to consent
- has daily access to internet at home

Exclusion criteria:

- Lack of digital skills to use a tablet/smartphone
- Lack of internet access

As in the previous phases a written consent form (Annex 6) and data security documents (Annex 7) were obtained from all participants before the pilot activities started. Signed by each participant and the original is stored in a locked cupboard at

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CCS premises. Only CCS staff has access to the originals. A copy was given to each participant.

In addition, all participants received an information sheet on the pilot action (Annex 13), training on how to use the digital solution and a manual summarising the relevant steps.

4.9.2 Communication and dissemination of pilot activities

Any data that arises from the pilot study are owned by CCS, with the support of MedicalSyn. On completion of the study, all data has been analysed and tabulated and used to prepare a final report— Deliverable D6.2. This deliverable (and all other agreed deliverables) is available to the public for review and accessible via the SHAPES website (www.shapes2020.eu). Participants are notified of the outcome of the study. CCS seeks to disseminate the findings from this study at conferences and in the scientific literature. Moreover, CCS disseminates the results of the pilot activities through CCS public relations (CCS newsletter, CCS website, LinkedIn, Xing). As per the SHAPES Publication Protocol, all publications arising from this study reflect the range of effort that has made them possible; including conceptualisation of the research project and research task, methodology development, data collection and analysis, interpretation and discussion of results; as well as project management. Any publications are read and meaningfully contributed to by all named authors. Participating SHAPES partners have the rights to use data from this study in their own analysis and dissemination plans. As detailed under 'Access to Data', Data Processing Agreements have been set up and signed by all partners to facilitate the sharing of pseudonymised data with specific SHAPES partners for specific purposes.

The pilot participants will receive a separate and summarised report in national language on the project results. This is an appreciation towards the participants. The participants gave their time, patience and experience to the project, thus it is still important to inform them about the results and outcomes of the project. The participants carry this information and the SHAPES idea into their community and contribute to its dissemination. This is good and beneficial for the sustainability of the project.

4.9.3 Risk management

All foreseeable data-related risks have been compiled into detailed risk assessment documents, which form part of the Data Protection Impact Assessments for phase 5 PT1-003 conducted in CCS. A risk classification, root cause, name, and consequences were assigned for each risk identified. Once identified, each risk was then analysed and attributed a score from 1 (unlikely/minor) to 4 (almost certain/critical) for probability and impact. Subsequently, appropriate mitigation actions were assigned, and an appropriate person responsible was identified. These risks

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have been reviewed during the course of the deployment. The identified data risk can be found in Annex 14.

In addition to data risks, there are a few risks identified, namely:

- Recruit of participants – since participants in this pilot theme must be active and live in the community, it can be challenging to reach these people as the partner institutions in the health and social area deal mainly with older adults with some degree of disability which is not what we are looking for in this study.
- Adherence to the intervention due to digital literacy issues, demotivation, difficulties in physical coordination, cognitive difficulties, or lack of interest.
- Risks associated with technology functioning at participants' home - such as device malfunction or lack of internet connection
- Risks related to health and wellbeing of participants

Finally, an ethics workshop has been conducted for UC-003 with all partners involved previous to the start of phase 5. This workshop allowed to jointly elaborate on potential risks and opportunities with respect to the ethical frameworks of SHAPES as well as to identify any mitigation actions.

4.9.4 Outcome of large-scale pilot activity

Overview

The phase 5 large-scale pilot of the SHAPES UC-PT1-003 was conducted between January 2023 and May 2023 with 13 participants.

To evaluate the results of phase 5 various tools were used for the evaluation. The results were presented according to the following subdivision:

- *Primary and secondary outcomes*
- *Recommendation for technical partners*
- *Evaluation of use case by using MAST*

Table 95: UC-PT1-003 phase 5 overview participants

Variables	Number of participants	Value
Age (years)	care receiver: 9 caregiver: 2 researcher: 2	Average age care receiver = 75,2 Average age caregiver = 37 Average age researcher = 38

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Gender Male Female	 5 (CR) 4 (CR) +2 (CG) + 2 (RE)=8	 38.46 % 61.54 %
Technological skills:		Advanced user: 9 Beginners: 4
Country:	Germany	100 %
Marital status: Married: Widowed: Other?	 7 2 4	 53.85 % 15.38 % 30.77 %
Occupational status: Retired Employed full time: Other?	 9 4	 69.23 % 30,77 %
Residence: House Flat	 8 5	 61.54 % 46.15 %

Primary and secondary outcome

The primary outcomes were to measure a predefined set of KPIs which have already been presented in chapter **4.5.2 Key performance indicators** as well as to evaluate the UC-PT1-003 use case using the MAST evaluation tool.

Table 96 provides an overview of the pilot with regards to KPIs. The last two KPIs are questions from the final interviews.

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Table 96: UC-PT1-003 KPIs

		school grading system / grade 3 should always be achieved = KPI (min.)								
		1 = excellent		2 = good		3 = sufficient		4 = poor		5 = insufficient
PT1-UC003 KPI for phase 5		complies with		complies with		complies with		complies with		complies with
KPI 1: successful participant recruitment (target 10 participants)	1	10	2	9-8	3	7-6	4	5-4	5	< 4
KPI 2: How many recruited participants remainded enrolled in the pilot until the end?	1	10	2	9-8	3	7-6	4	5-4	5	< 4
KPI 3: How many % of the participants carried out the video call solution at least 1 x during phase 5?	1	100%	2	<100-80%	3	<80-60%	4	<60-45%	5	<45%
KPI 4: How many % of the participants have carried out the video call solution several times during phase 5?	1	100-80%	2	<80-50%	3	<50-30%	4	<30-10%	5	<10%
KPI 5: How many % of the connections were rated at least as sufficient?	1	100-80%	2	<80-60%	3	<60-50%	4	<50-40%	5	<40%
KPI 6: How many % of all support cases during the test phase are serious cases? What are serious support cases? - System crash, user cannot log in, system does not collect data, support from/with TecPartners necessary, ...	1	5%	2	>5%-10%	3	>10%-15 %	4	>15%-20%	5	>20%
KPI 7: SUS Score (System Usability Scale)	1	Best Imaginable (100%)	2	Excellent (>80 %)	3	Good (80-60%)	4	Poor (<60%)	5	Worst Imaginable (<15%)
KPI 8: How many % of the participants are willing to use the digital solutions after the test phase?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 9: In general, how many % of the participants feel that it would be useful to develop a specific platform for healthy ageing?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
Summary						At least 70% of the KPIs must be met for the UC to be successful.				

KPI 1 At least 60% of the target cohort were successfully recruited into the pilot during the recruitment period.

Table 97: UC-PT1-003 KPI 1

Parameter	CCS
Target number of participants	10
Number of participants recruited	13
Percentage recruited	>100%

The target of 10 participants was exceeded as two care givers and nine care receiver were recruited. In addition, two researcher accompanied the whole process. The target was thus overachieved.

KPI 2 At least 60% of recruited participants remained enrolled in the pilot until the end of the pilot.

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Table 98: UC-PT1-003 KPI 2

Parameter	Value
Number of participants at baseline	13
Number of dropouts	1
Number of participants at end of study	12
Percentage retained	92,31%

One participant did not complete the pilot to the end. The reason was dissatisfaction with the technique used in UC-PT1-001 and being overwhelmed with the technology, especially the SHAPES App.

KPI 3 At least 60% of the participants carried out the video call solution at least 1 x during phase 5.

Table 99: UC-PT1-003 KPI 3

Parameter	Value
Number of participants during pilot.	10
Number of participants carried out the video communication solution at least once.	10
Percentage tried	100%

All recruited participants have used video telephony at least once with a caregiver, except for the participant who dropped out beforehand. Annex 41 shows the number of connections.

KPI 4 At least 30% of the participants have carried out the video call solution several times during phase 5.

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Table 100: UC-PT1-003 KPI 4

Parameter	Value
Number of participants during pilot.	10
Number of participants carried out video telephony more than once.	5
Percentage of participants carried out the video call solution several times during phase 5	50%

In total, the solution was used 22 times by different participants. The video consultation was not used more often by most of the participants because, on the one hand, no personal address book of the users could be stored (this required that friends and family also use the solution or have access to it). Only the SHAPES IDs of the participants were visible, but for data protection reasons the participants did not know which person was behind the ID. On the other hand, most of the participants did not know each other, so they only had the opportunity to test the solution with their care giver. Some participants knew each other and exchanged IDs privately to make video calls. The overview of the number of weekly appointments can be found in Annex 41.

KPI 5 At least 50% of the connections were rated as sufficient.

Table 101: UC-PT1-003 KPI 5

Parameter	Value
Number of video calls conducted	22
Number of video calls with evaluation	16
Number of participants who were satisfied with the solution	9
Number of participants who were not satisfied with the solution	0
Number of participants who were neither satisfied nor dissatisfied	7
Percentage of calls rated as satisfied	56,25%

The satisfaction with the solution was confirmed by all participants during the interviews. Even though there were some minor suggestions for improvement from

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some participants, the level of satisfaction was very high among all. The evaluation overview can be found in Annex 42.

KPI 6 A maximum of 15% of all support cases can be serious support cases.

Table 102: UC-PT1-003 KPI 6

Parameter	Value
Number of support cases	2
Number of serious support cases	2
Percentage supported	100%

In total, there were two support cases where CCS staff had to visit the participants because they were not able to solve the problem on their own, not even under supervision. Out of 22 connections, there were only 2 support cases. Since there are always two participants per connection, we have to assume 44 possible problem situations, so only 2 serious support cases are not much. Nevertheless, the KPI has not been reached, as 2 out of 2 support cases were serious.

KPI 7 At least "Good" is the overall score in the System Usability Scale (SUS) about all participants.

Table 103: UC-PT1-003 KPI 7

Parameter	Value
SUS Score participant 3	95
SUS Score participant 4	80
SUS Score participant 5	95
SUS Score participant 6	92,5
SUS Score participant 9	85
SUS Score participant 10	97,5
SUS Score participant 11	97,5
SUS Score participant 15	80

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Care giver CG 20	97,5
Care giver CG21	97,5
Average SUS Score (pp.+cg.)	**91,75**
Researcher RE30	97,5
Researcher RE31	97,5
Average SUS Score (incl. res.)	**92,7**

The SUS score for all participants was between 80 and 97,5. The average score was 91,75 for care receiver and the care giver. The average score inclusive the researcher was 92,7. The difference in rating among care receivers probably depends on the degree of technical affinity. Overall, the participants rated the solution as excellent. (see Annex 43)

KPI 8 At least 50 % of the participants are willing to use the digital solutions after the pilot phase.

Table 104: UC-PT1-003 KPI 8

Parameter	Value
Number of participants in total.	10
Number of participants who are willing to use the digital solutions after the pilot phase.	10
Percentage	100%

All participants who have used the application would continue to use it in the future, taking into account the improvements (interview outcome).

KPI 9 At least 50 % of the participants feel that it would be useful to develop a specific platform for healthy ageing.

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Table 105: UC-PT1-003 KPI 9

Parameter	Value
Number of participants in total.	10
Number of participants who feel that it would be useful to develop a specific platform for healthy ageing?	9
Percentage	90%

90 % of the participants think that there should be a free platform for healthy ageing in every country in Europe (interview outcome).

Overview of KPI achievement

Table 106: UC-PT1-003 KPI Overview – Results phase 5

Key performance indicator	Achieved during large-scale pilot activity (yes/no)	Comments
KPI 1	yes	Score 1
KPI 2	yes	Score 1
KPI 3	yes	Score 1
KPI 4	yes	Score 2
KPI 5	yes	Score 3
KPI 6	no	Score 5 but only 2 support cases in total
KPI 7	yes	Score 2
KPI 8	yes	Score 1
KPI 9	yes	Score 1

Overall KPIs from PT1 - UC003

At least 70 % from all KPIs must be successful. This means that at least 70% must achieve at least score 3 for the KPI to be considered successful.

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Table 107: UC-PT1-003 Percentage of successful KPIs

Parameter	Value
Number of KPIs	9
Number of successful KPIs	8
Percentage of successful KPIs	88.89%

Conclusion:

The target was thus achieved, as almost all KPIs (except one) were successful since at least score three in each category was achieved. Based on the collected data, interviews, but also on the evaluation by SUS, the KPI categories show that video communication solution was assessed as useful, user-friendly and meaningful. KPI 6 was not achieved, as it was only a small group of test users, and two support cases therefore already represent approx. 17%.

Evaluation of MAST

The MAST framework as already introduced in chapter *4.4.2 Planning of evaluation.* The evaluated data/outcome are presented in Table 108. A complete overview of the harmonised data can be found in Annex 44.

Table 108: UC-PT1-003 MAST Evaluation phase 5

MAST Domain	Topic	Outcome	Baseline (mean/SD)	End of pilot (mean/SD)	Chang in mean (SD)
Clinical Effectiveness	Mental health	OSSS-3 (social support) and life events	M = 10,85 SD = 0,86 Med = 11 Min = 10 Max = 12 **“moderate social support”**	M = 10,91 SD = 0,86 Med = 11 Min = 10 Max = 12 **“moderate social support”**	1 dropout
	Effects on health-related quality of life	EQ-5D-5L VAS	**Health Status** M = 83,08 SD = 13,23 Med = 80 Min = 60 Max = 100	**Health Status** M = 84,17 SD = 13,20 Med = 80 Min = 60 Max = 100	1 dropout
			Domain 1	**Domain 1**	1 dropout

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		WHOQOL-BREF scores	M = 27,77 SD = 4,90 Med = 26 Min = 19 Max = 34	M = 28,5 SD = 4,37 Med = 27,5 Min = 21 Max = 34	
			Domain 2 M = 25,69 SD = 2,99 Med = 25 Min = 20 Max = 29	**Domain 2** M = 26,17 SD = 2,61 Med = 26 Min = 21 Max = 29	1 dropout
			Domain 3 M = 8,46 SD = 1,55 Med = 8 Min = 6 Max = 10	**Domain 3** M = 8,67 SD = 1,43 Med = 9 Min = 6 Max = 10	1 dropout
			Domain 4 M = 35,07 SD = 2,97 Med = 35 Min = 28 Max = 38	**Domain 4** M = 35,67 SD = 2,25 Med = 36 Min = 31 Max = 38	1 dropout
Patient perspectives	Satisfaction and acceptance	User acceptance (TAM score)	/	**Ease of use:** M = NA SD = NA Med = NA Min = NA Max = NA	
				Future use: M = 4 SD = 0 Med = 4 Min = 4 Max = 4	
				Usefulness: M = 5 SD = 0 Med = 5 Min = 5 Max = 5	

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	Understanding of information Confidence (in the treatment) Ability to use the application Access & Accessibility	Usability of application (SUS Scores)	/	M = 92,7 SD = 6,65 Med = 96,25 Min = 80 Max = 97,5 **>80% = Good to excellent usability**	Incl. Researcher
		Usability of application (1-item health literacy)	M = 4,31 SD = 0,46 Med = 4 Min = 4 Max = 5	M = 4,33 SD = 0,47 Med = 4 Min = 4 Max = 5	
	Empowerment Self-efficacy	User engage-ment	Number video calls	End of pilot	1 dropout
		Self-efficacy (GSES)	M = 31,08 SD = 1,59 Med =30 Min = 28 Max = 33	M = 31,33 SD = 1,37 Med =31 Min = 30 Max = 33	
Economic aspects	Amount of resources used when delivering the application and comparators	Cost of devices (Cost as per device purchasing invoice)	• Tablet: 328,57€ • Protective cover tablet: 13,99€		
		Cost of using digital solutions and	• Electricity (charging the tablet) • Wi-Fi connection • Server MedSyn • SHAPES platform itself • SHAPES Marketplace		

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		SHAPES platform	
		Cost of staffing (Timesheets and costing data)	• Training the users • Travel cost • Development updated version • Remote support via phone • Support in person
***Not available as they were customized solution, and they aren't at a commercial stage as yet**			

Secondary outcomes

At the end of the phase 5, final interviews were conducted with the participants. These contained questions divided into four different categories.

- Perception and understanding
- Interaction / Intuition / Function
- Design / Layout
- General feedback

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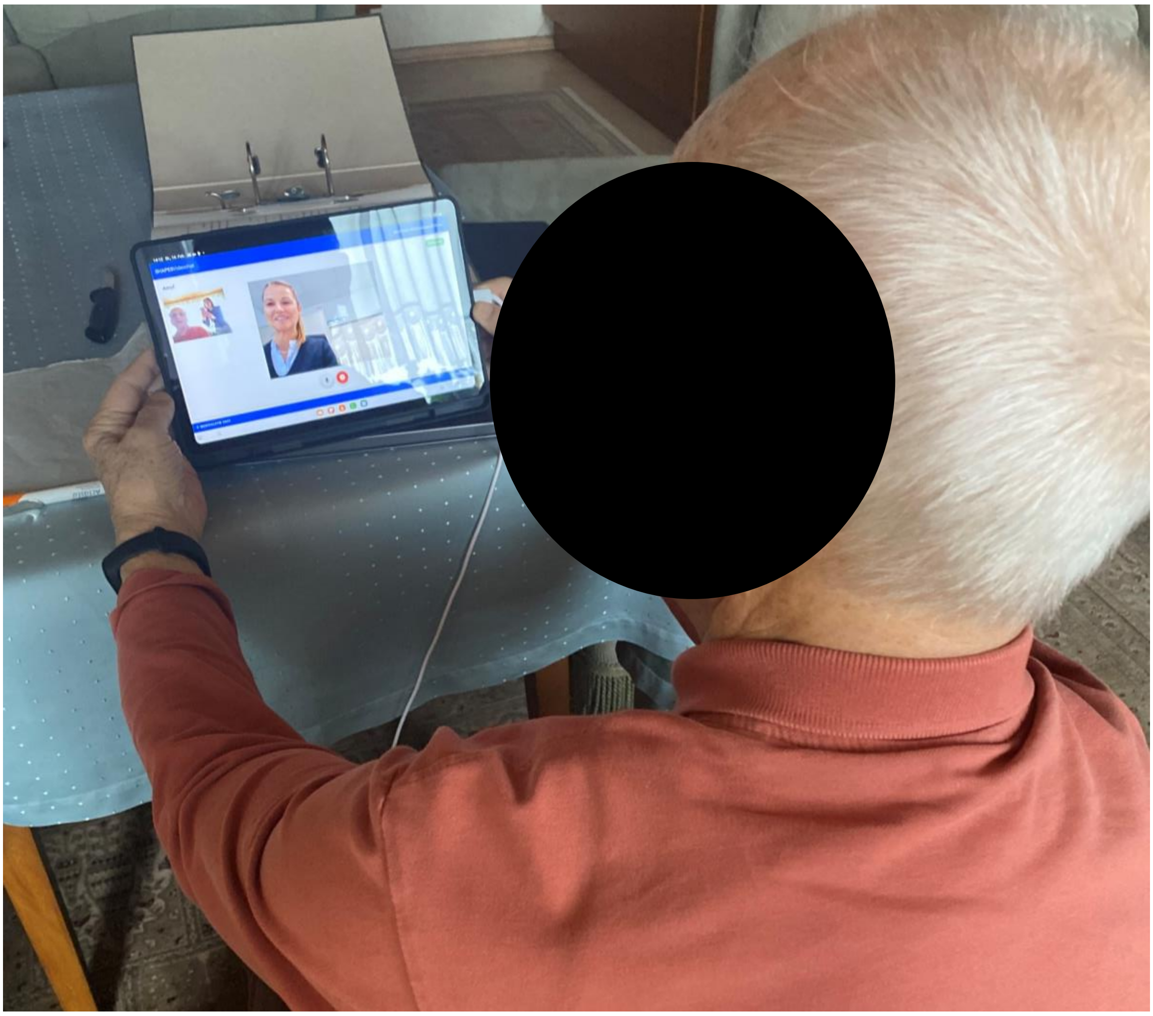

Figure 23: UC-PT1-003 phase 5, participant during video telephony

A complete overview of the results of the interviews can be found in Annex 45.

Perception and understanding

All participants agreed that the application in UC 003 was understandable and therefore easy to use. The visualisation was also appealing to all. Some participants particularly liked the video telephony among all the other applications. Nevertheless, participants criticised the need to make an appointment with a family member before a video call and the lack of an alarm function for a call. The integration into the SHAPES App was also a suggestion, as all relevant applications can be viewed at a glance.

Interaction / Intuition / Function

The handling was comprehensible for all, and the functions could be found easily. Only the question of whether the tablet is allowed to access the microphone and camera confused some participants or made them uncertain. As described above, participants lack notification when others call. In addition, a few participants mentioned screen sharing and voice control as additional desirable functions.

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Design / Layout

The participants considered the layout to range from "okay" and "neutral" to "good" and comprehensible. But they were not overly enthusiastic either. There is still room for improvement in the design. Nevertheless, all the content was easy to read. The participants were not overwhelmed.

General feedback

The participants thought that the basic idea of the Shapes App was good overall. With one exception, they all see a platform for healthy ageing as meaningful. However, there was great disagreement on the question of payment for such a platform. Some would be willing to pay for it depending on the final level of implementation, the costs and only with a free trial period. Others would not pay for it. Especially this use case was considered good because everything worked, unlike other use cases. After a short briefing or instruction, all participants were confident to use the App without further support.

With regard to the evaluation of usefulness, the other case studies were considered more useful, as there are already similar applications for video telephony and a simple phone call would be sufficient to stay in contact. The application is nice to have but not absolutely necessary.

The participants would continue to use the video telephony solution, taking into account the suggestions for improvement. They think that the technical solution is suitable for;

- overcoming the fear of digital technologies because the solution is easy to use
- competent usage of technologies because the solution is user-friendly and intuitive handling;
- integration in the social environment because it is possible to easily stay in touch with family/friends and thus the solution could be assigned to the point of problem solving in the community.

Recommendations for tech-partners during and after the pilot

Overall, the technical solution was rated very well by all 13 participants (SUS Score 92,7). The solution was technically excellent and functional at all times. The participants were satisfied with the functions and design of the solution and considered it user-friendly. However, there are recommendations for improvements to adapt the solution to the needs of the target group. Six main points for further development could be identified:

- Notifications: when someone calls there should be a notification;
- Spontaneous calls should be possible without making an appointment in advance:
- Integration of the video telephony App into the SHAPES App

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- Screen sharing
- Voice control
- Group consultation/ chat

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4.10Phase 5: Large Scale Pilot Activity replicating site OMN

Overview about replicating site:

Table 109: UC-PT1-003 replicating OMN, overview

Replicating site	
Name	OMNITOR
Shortcut	OMN
Location	Sweden
Participants involved in replicating of this UC (Number in total)	29
Participants in the role of a care receiver Number	 24
Participants in the role of a caregiver Number	 5
Participants in the role of a researcher	0
Duration of replicating (days)	30 – 60 days

The technology used in the replication was the SHAPES Front-end App together with the eCtouch App which could be read in D5.4 Chapter 11 respective D5.4 section 5.10. This was developed together with EDGE and offered/used in different pilot themes, and such a minor adaptation was made for this pilot replication. OMN choose to use the Front-end App together eCtouch App because of the familiarity and control of the Apps, which leads to that better support (first and second line) could be given to the pilot sites.

The servers for a video call are located in Sweden, which made it easier for the municipalities and county council's IT department of the pilot sites to do the risk management, which also was appreciated by the admins.

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4.10.1 Recruitment

The recruitment was conducted with OMN and the help of two municipalities and one county council in Sweden. In total OMN aimed for twenty people with the hopes that each municipality and county council could provide ten people each, which gave room if a participant should decline later on.

The vast majority of the participants in their own homes in urban areas, some live in suburban areas and a few in rural areas.

Some dissemination workshops were carried out together with the help of the municipalities.

OMN also made market flyers that were posted on postal boards, at the municipality's center for older adults, or information center hosted by the county council.

The interested participants contacted the municipality/county council admin, and the admins had a continuous dialogue with OMN.

Eligibility criteria

The participant's criteria for this pilot were set to 65 years plus. The expectation from each participant is to use the solution at least two/three times per week during phase 5. After the pilot, a shorter interview was held.

The participants had access to information sheets and their relatives and friends had access to the installation manual. The information sheet contained information about the pilot, the SHAPES project, and Data Protection, where it states all users are anonymized i.e. no name is mentioned or stored. All videos and text are going through servers in Sweden, no video is saved, and text is saved on the participant's tablet and can be erased by the participant.

Inclusion criterial / Exclusion criteria:

No specific inclusion criteria or exclusion criteria were implemented, OMN aimed for a mixed group of participants. OMN together with the municipalities could select a specific participant if it benefited the participant positively. For example, giving a participant a task in their daily life to reduce their loneliness or anxiety.

4.10.2 Communication and dissemination of pilot activity

Start of the pilot. OMN had constant contact with the pilot sites. Individual training sessions were held to help the participant to get everything set up.

During the pilot. Communication was held continuously with OMN and the admins. Participants got first-line support from the admins and second-line support from OMN.

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After the end of the pilot. There are no plans to inform each participant of the results, most of the participants seemed to have a minor interest in knowing the results. However, some follow-ups with the admins of the pilot sites will be conducted after the SHAPES project end, where we might have a free discussion about some results and findings, gather additional feedback, and could present data proof that all data is deleted.

4.10.3 Risk management

Before the pilot, there is always the risk of not being able to recruit any or enough participants. This was mitigated by having contact with multiple municipalities or county councils, as well as holding small talks with older adult associations. This was further mitigated by having older relatives and friends help with the recruitment of their friends.

Each municipality and county council did a risk management called “Klassa” in Swedish before a pilot could start. The “Klassa” is for the municipality and county council to classify the risk and possible damage it can do, should something go unexpected.

4.10.4 Outcome of large scale pilot activity

Overview

The first participant got access to SHAPES platform 07/03-2023, which marks the start of the pilot. The pilot started to finish on 03/05-2023, which was when the first final interview was held. The last interview was held on 2023-06-01, which marks the end of the pilot.

To evaluate this pilot, each participant had to do a WHOQL-Bref both before and after the pilot. At the end of the pilot, a smaller interview was conducted together with the WHOQL-Bref.

Data gathering on the number of calls and by whom, and the optional question call quality rate can be collected from OMN server.

- Socio-demographics of the participants

Table 110: UC-PT1-003 replicating OMN, socio-demographics of the participants

Variables	Number of participants	Value

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Age (years)	care receiver caregiver	Average age care receiver = Mid 70 Average age caregiver = Early 30's
Gender Male Female		 37% 63%
Technological skills:		Advanced user: 15 Beginners: 9
Country: Sweden		100%
Marital status: Married Widowed Other?		38% 21% 41%
Occupational status: Retired Employed full time: Other?		79% 4% 17%
Residence: What kind?	Own Home Other	96% 4%

<u>Primary and secondary outcome</u>

<u>Primary outcome</u>

The following tables present the data used to determine the success of each KPI. Table 111 provides an overview of the success of the pilot with regards to KPIs.

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Overview about KPIs (CCS piloting):

Table 111: UC-PT1-003 replicating OMN, overview KPIs

	school grading system / grade 3 should always be achieved = KPI (min.)									
PT1-UC003 KPI for phase 5		1 = excellent complies with		2 = good complies with		3 = sufficient complies with		4 = poor complies with		5 = insufficient complies with
KPI 1: successful participant recruitment (target 10 participants)	1	10	2	9-8	3	7-6	4	5-4	5	< 4
KPI 2: How many recruited participants remained enrolled in the pilot until the end?	1	10	2	9-8	3	7-6	4	5-4	5	< 4
KPI 3: How many % of the participants carried out the video call solution at least 1 x during phase 5?	1	100%	2	<100-80%	3	<80-60%	4	<60-45%	5	<45%
KPI 4: How many % of the participants have carried out the video call solution several times during phase 5?	1	100-80%	2	<80-50%	3	<50-30%	4	<30-10%	5	<10%
KPI 5: How many % of the connections were rated at least as sufficient?	1	100-80%	2	<80-60%	3	<60-50%	4	<50-40%	5	<40%
KPI 6: How many % of all support cases during the test phase are serious cases? What are serious support cases? - System crash, user cannot log in, system does not collect data, support from/with TecPartners necessary, …	1	5%	2	>5%-10%	3	>10%-15 %	4	>15%-20%	5	>20%
KPI 7: SUS Score (System Usability Scale)	1	Best Imaginable (100%)	2	Excellent (>80 %)	3	Good (80-60%)	4	Poor (<60%)	5	Worst Imaginable (<15%)
KPI 8: How many % of the participants are willing to use the digital solutions after the test phase?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
KPI 9: In general, how many % of the participants feel that it would be useful to develop a specific platform for healthy ageing?	1	100-90%	2	<90-75%	3	<75-50%	4	<50-25%	5	<25%
Summary						At least 70% of the KPIs must be met for the UC to be successful.				

KPI 1 At least 60% of the target cohort were successfully recruited into the pilot during the recruitment period.

Table 112: UC-PT1-003 replicating OMN, KPI 1

Parameter	Value
Target number of participants	10 - 20
Number of participants recruited	35
Percentage recruited	175%

The popularity to participate and help in this pilot site where hard to foresee. With more interested participants than the intended recruitment number. This unfortunately made us to have to limit the number of participants, where the ones that seems most serious were selected.

The participants that had the mentality to “only log in once”, had to be kindly rejected.

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The participants that had the mentality "I can do this, but I could also skip", were put in a "reserve" group with a compromise that we might be able to help them test the solution after the pilot, should they still be interested.

KPI 2 At least 60% of recruited participants remained enrolled in the pilot until the end of the pilot.

Table 113: UC-PT1-003 replicating OMN, KPI 2

Parameter	Value
Number of participants at baseline	24
Number of dropouts	0
Number of participants at the end of the pilot	24
Percentage retained	100%

All participants that started with the pilot remained until the end of the pilot.

KPI 3 At least 60% of the participants carried out the video call solution at least 1 x during phase 5.

Table 114: UC-PT1-003 replicating OMN, KPI 3

Parameter	Value
Number of participants during pilot	24
Number of participants carried out the video call solution at 1 x during phase 5	24
Percentage of participants carried out the video call solution at 1 x during phase 5	100%

Every participant conducted more than one call during the pilot.

KPI 4: At least 30% of the participants have carried out the video call solution several times during phase 5.

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Table 115: UC-PT1-003 replicating OMN, KPI 4

Parameter	Value
Number of participants during pilot	24
Number of participants carried out the video call solution several times during phase 5	24
Percentage of participants carried out the video call solution several times during phase 5	100%

Every participant conducted several calls during phase 5.

KPI 5: The average satisfaction with the video calls carried out corresponds to at least "okay".

Table 116: UC-PT1-003 replicating OMN, KPI 5

Parameter	Value
Number of video calls conducted	683
Number of video calls rated "very good".	237
Number of video calls rated "okay".	55
Number of video calls rated "very good" and "okay".	292
Percentage of video calls rated at least "okay"	92%

In general, most video calls was rated “very good” or “okay”. An optional four-star rating system was used for the rating, so the users had to take a “stance” and can’t rate the middle option. Some pixels on video could happen, but this depends more on the caller and Callee’s internet connection than the solution itself.

KPI 6: A maximum of 15% of all support cases can be serious support cases.

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Table 117: UC-PT1-003 replicating OMN, KPI 6

Parameter	Value
Number all support cases.	16
Number of serious support cases.	0
Percentage of serious support cases.	0%

Most of the support cases were conducted at the beginning of the pilot. This where often in cases where the participants had problems with login-in on the SHAPES platform, this could be cases where the tablet did not have access to the internet, and easily solved once the tablet had internet access. Other instances could be when the participants forgot their password.

After everything was up and running, most support cases came from the users who needed additional licenses to give to their family and friends to conduct a video call with.

KPI 7 At least "Good" is the overall score in the System Usability Scale (SUS) about all participants.

Table 118: UC-PT1-003 replicating OMN, KPI 7

Parameter	Value
SUS Score participant 1	80
SUS Score participant 2	70
SUS Score participant 3	70
SUS Score participant 4	92.5
SUS Score participant 5	90
SUS Score participant 6	90
SUS Score participant 7	95
SUS Score participant 8	92.5
SUS Score participant 9	77.5
SUS Score participant 11	90
SUS Score participant 12	67.5

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SUS Score participant 13	95
SUS Score participant 14	77.5
SUS Score participant 15	77.5
SUS Score participant 16	90
SUS Score participant 17	92.5
SUS Score participant 18	80
SUS Score participant 19	92.5
SUS Score participant 22	82.5
Average SUS Score over all participants	85.68

The entire SUS score is not available from each participant. The ones that we manage to gather gave an overall score of “Excellent”.

KPI 8 At least 50 % of the participants are willing to use the digital solutions after the pilot phase.

Table 119: UC-PT1-003 replicating OMN, KPI 8

Parameter	Value
Number of participants in total	24
Number of participants who are willing to use the digital solutions after the pilot phase.	18
Percentage	75%

Many of the participants stated that they were willing to use the digital solution after the pilot, which led OMN to decide to not deactivate the users until the end of the SHAPES project and the beginning of 2024.

KPI 9 At least 50 % of the participants feel that it would be useful to develop a specific platform for healthy ageing.

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Table 120: UC-PT1-003 replicating OMN, KPI 9

Parameter	Value
Number of participants in total	24
Number of participants who feel that it would be useful to develop a specific platform for healthy ageing.	18
Percentage	75%

Most of the participants added the comment that such a platform of technology should be free.

When the interviewer asked if such a platform should be paid for by governmental funds, the answer was unanimous “Yes”. Dedicated governmental staff that could support them if they had a problem with the technology was also important. Same as user-friendliness was also an important factor.

<u>Overview of KPI achievement</u>

Table 121: UC-PT1-003 replicating OMN, KPI achievement

Key performance indicator	Achieved during large-scale pilot activity (yes/no)	Comments
KPI 1	Yes	
KPI 2	Yes	
KPI 3	Yes	
KPI 4	Yes	
KPI 5	Yes	
KPI 6	Yes	
KPI 7	No	OMN where not able to gather SUS from all participants, however from the ones we manage to gather majority had the response at least “Good”.
KPI 8	Yes	
KPI 9	Yes	

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Overall KPI from this UC003 At least 70 % from all KPIs must be successful.

Table 122: UC-PT1-003 replicating OMN, overall KPI

Parameter	Value
Number of KPIs	9
Number of successful KPIs	8
Percentage	89%

Conclusion:

The overall KPI suggests a “good” outcome. From OMN side, it was a pleasure to see engaging and driven participants.

Evaluation of MAST

The MAST framework as already introduced in chapter *2.4.2 Planning of evaluation* was used to evaluate the effectiveness and contribution of UC-PT1-003 to quality of care. The evaluated data/outcome are presented in Table 123. A complete overview of the harmonised data can be seen in Annex 46.

Table 123: UC-PT1-003 replicating OMN, MAST Evaluation

MAST Domain	Topic	Outcome	Baseline (mean/SD)	End of pilot (mean/SD)	Change in mean (SD)
Clinical Effectiveness	Mental health	OSSS-3 (social support) and life events	M = Nil SD = Nil Med = 3 Min = 1 Max = 5 **“what kind of social support”**	M = Nil SD = Nil Med = 3 Min = 1 Max = 5 **“what kind of social support”**	
	Effects on health-related quality of life	EQ-5D-5L scores	**Health Status** M = Nil SD = Nil Med = 3 Min = 1 Max = 5	**Health Status** M = Nil SD = Nil Med = 3 Min = 1 Max = 5	
			Domain 1	**Domain 1**	0.26

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		WHOQOL-BREF scores	M = 3.58 SD = 1.44 Med = 3 Min = 1 Max = 5	M = 3.84 SD = 1.30 Med = 3 Min = 1 Max = 5	
			Domain 2 M = 3.75 SD = 1.03 Med = 3 Min = 1 Max = 5	**Domain 2** M = 3.84 SD = 1.04 Med = 3 Min = 1 Max = 5	0.09
			Domain 3 M = 3.75 SD = 1.22 Med = 3 Min = 1 Max = 5	**Domain 3** M = 3.81 SD = 1.31 Med = 3 Min = 1 Max = 5	0.06
			Domain 4 M = 4.42 SD = 0.81 Med = 3 Min = 1 Max = 5	**Domain 4** M = 4.54 SD = 0.75 Med = 3 Min = 1 Max = 5	0.12
Patient perspectives	Satisfaction and acceptance	User acceptance (TAM score)	/	**Ease of use:** M = 4.42 SD = 0.717 Med =3 Min =1 Max = 5	
				Future use: M = 4.25 SD = 0.94 Med = 1 Min = 3 Max = 5	
				Usefulness: M = 4.41 SD = 0.65 Med = 3 Min = 1 Max = 5	

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	Understanding of information	Usability of application (SUS Scores)	/	M = 85.68 SD = 9.23 Med = 68 Min = 0 Max =100	
	Confidence (in the treatment) Ability to use the application Access & Accessibility	Usability of application (1-item health literacy)	M = Nil SD = Nil Med = 3 Min = 1 Max = 5	M = Nil SD = Nil Med = 3 Min = 1 Max = 5	
	Empowerment Self-efficacy	Self-efficacy (GSES)	M = Nil SD = Nil Med = 3 Min = 1 Max = 5	M = Nil SD = Nil Med = 3 Min = 1 Max = 5	
Economic aspects	Amount of resources used when delivering the application and comparators	Cost of devices (Cost as per device purchasing invoice)	• Tablet/smartphone: • Protective cover tablet (optional): • Screen protector (optional):		
		Cost of using digital solutions and SHAPES platform	• Electricity (charging the tablet) • Wi-Fi connection/SIM data: • License for video solution • SHAPES platform: • SHAPES Server: • SHAPES Marketplace?		

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		Cost of staffing (Timesheets and costing data)	• Training the users • Travel cost • Development updated version • Remote support via phone/TeamViewer • Support in person
***Not available as they were customized solution, and they aren't at a commercial stage as yet**			

Secondary outcomes

The final interview held with some health care professionals and group interview with some participants yielded overall positive feedback. Complete results of the interviews can be found in Annex 47.

Perception and understanding

At first, most participants associate the communication tool with SHAPES. However, they did also recognize that the pilot they were a part of was a scaled-down version of the adaptive system (SHAPES platform).

The application was understandable, and the participant could operate it themselves the majority of the time. The pros of this application where its eases of use.

Some cons of the application were how the SU address was used for the call, also sometime the call could have some pixilation or lag.

Interaction / Intuition / Function

The overall interaction, intuition, and function provided good results. The participants had no problem with understand how video and call functions worked.

The problem that arise could be how everything was set up, i.e. logging in SHAPES App to start another App. Also, the function to add a favourite contact could be made easier.

Design / Layout

Both the Front-end App and eCtouch App had a good appearance and was well structured. This could be contributed to the Front-end App did not have multiple Apps and the eCtouch App being set up to the needs of the user at the beginning of the pilot. Some features that were appreciated were its lack of too many settings, which led the participants to feel in control of the App. Also, the functionality to increase text and button size was appreciated.

Some features that health care professionals appreciated were the functions to easily set up a high contrast view which was hard to set up if it even exists on 'free' Apps.

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General feedback

The general feedback from the participants is that they think it was fun to be a part of the project. And the overall majority of the participants liked the technologies involved.

The healthcare professionals and participants could see the value in having an App developed for healthy aging, however, the participants could be price sensitive, and prefer such an App to be free or paid for by the government/municipalities/ County Council.

Recommendations for tech-partners during and after the pilot

One thing that could be changed is, if the front-end App only contains one application, it could start that specific application as soon as you log in.

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5 Use case 004

The UC004 - Robot to Support Older Adults to Live Independently and Remain Socially Connected - was conducted independently of CCS. The UC leader of UC004 was Clinica Humana (CH), Spain.

The exclusive author of this chapter is therefore CH.

5.1 Introduction

This chapter describes the pilot activities of UC-PT1-004 Robot to Support Older Adults to Live Independently and Remain Socially Connected. Target persons of this use case were aged 65 and older, living independently at home or in residential care homes. The SHAPES Persona for this pilot theme is 'Helena':

- Older adult
- Wants to be autonomous
- Difficulty to walk
- Needs to be encouraged to participate in social activities
- Needs to be supported with more movement and exercises
- Needs that her daughter doesn't worry about her
- Wants to keep old relationships
- Wants to always have something to do

Objectives

The main objective of the use case is to evaluate the user engagement and self-perceived usefulness of a digital solution addressed to assist older adults in keeping active, including the promotion of social activities. The use of a social humanoid robot, in addition to the incorporation of features which enable the integration of the healthcare pathway, gives an active role to the technology as the robot displays suggestions of activities and functionalities such as sending alerts to caregivers.

Clinika de Kay (CH) is the use case leader. There are no replicating sites.

5.2 Description

In this use case we addressed older adults living independently in their own houses or residential care homes. They usually live alone or with their wife/husband and are visited or supervised by a family member or caregiver on a regular basis.

In order to remain independent, they often need assistance to remember appointments or to make/solve certain basic actions, such as taking the medication, use home devices, home exercises, etc. Another important issue is that they are at

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risk of isolation, and communication and social engagement must be reinforced/sustained. All of these can be promoted using a socially assistive robot that use verbal and non-verbal behaviour by moving its arms, head and eyes and also offers touch-screen tablet experience in order to enrich the interaction.

The robot has been provided with:

- Agenda and reminders for a variety of situations (appointments, local cultural activities, medicine intake, exercise routine, etc.);
- Pre-defined messages to send to relatives and/or caregivers to let them know of the user's health status;
- Entertainment games such as solitaire and puzzles;
- Communication with community (neighbours, friends, caregiver, general practitioner, etc.) by enabling video call / calling options.

5.3 Digital solutions used in this use case

ARI (PAL)

Digital solution interacting with target users. ARI is a social humanoid robot with capability of moving arms and head and is provided with speakers, microphone, a front screen and an attached tablet for user interaction. ARI was adapted in order to provide the functionalities described in the description section and integrated additional SHAPES Digital Solutions described in this section.

Face recognition (VICOM)

Algorithm integrated in ARI to support the user authentication process. The face recognition allows verifying whether the person in front of ARI's frontal head camera is the expected user, or not. The expected user is that of the token provided by ASAPA for a limited time in the initial authentication. This way the interaction during the subsequent authentications is improved, as the number of times in which the user should write the username and password is reduced (ideally, only the first time). However, this functionality hasn't been used in Phase 5. This functionality was tested during Phase 3 and 4 and the performance was pretty good. However, just before Phase 5 and due to a bug, the software stopped working on the robot. Due to the time constraint and since face recognition was not considered key to the project success, it was decided to proceed without this functionality.

Adilib chatbot (VICOM)

The chatbot enables natural language interaction with robot users. Coupled with the speech recognition module (see below), what user says was interpreted by the chatbot in order to provide navigation through ARI's menu and have trivial conversations through voice. Opposite to a simple speech recognition (user has to say the desired

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option in a strict way, strict words to be recognised), a chatbot offers a natural language communication. New conversations are designed and adjusted based on user needs.

ROSA (CH)

ROSA is a chatbot for communicating with older persons. Dialogue structures, currently used for following up people with heart failure, were adapted to guide ARI's users through the several menus and functionalities.

Speech recognition (VICOM)

Speech recognition enables the transcription of user voice messages to text. Speech recognition was installed in SHAPES platform and was communicate with ARI through the internet. Speech recognition is necessary to enable user voice interaction with Adilib chatbot, for this user case, in the Spanish language.

Emotion recognition (TREE)

An algorithm which analysis face biometrics in order to predict emotions within a category set. It was activated only if consent is given by the user. Emotion recognition was used for the analysis of engagement during the interaction.

***eCtouch* (Omnitor)**

Total conversation app available on IOS, Android, and Windows offers video, audio, and RTT (Realtime text), that can be used using the robot's Android tablet.

5.3.1 Digital solutions used for COVID-19 response

Temperature monitoring is incorporated into the robot where the robot captures user temperature through its thermal camera, and if the temperature is too high, it offers the option to send an email to the user's caregiver. This can be then visualised in the eCare platform. The final implementation, in any case, was discussed due to the temperature monitoring of the robot not being a validated medical device.

5.3.2 Equipment and devices used (from third parties)

One additional hardware and software external device was used in UC-PT1-004

- Android tablet

5.4 Data plan

The data plan for PT1-004 includes the:

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- Data Protection Impact Assessment (DPIA) document that assesses whether the processing of personal data is on a right level from GDPR point of view and describes the potential corrective actions that has been taken.

- Personal Data Processing Descriptions that provide detailed information about how personal data is collected, processed, and stored.

- DPIA risk assessment that identifies all the risks, its impact and probability and proposes actions for risk mitigation.

- Data Processing Agreement that defines the responsibilities and obligations of the data controller and the data processor regarding the processing of personal data.

- Data Sharing Agreement that sets out the purpose, type and scope of data sharing within PT1-004.

The complete data plan can be seen in Annex 48.

5.4.1 Data capture methods to be used

A range of different data capture methods was used throughout the five phases of this pilot. Below is a list of these methods detailed in the sections describing each pilot phase.

Phase 1

- Scenarios and data plan definition.

Phase 2

- Brainstorming to generate mock-ups;
- A/B tests with domain experts;
- Semi-structured interviews.

Phase 3

- Test with real users in a controlled environment;
- Usability and acceptability questionnaires;
- physiological questionnaires;
- Critical incident registration;
- Logs registration;
- Semi-structured interviews with users.

Phase 4

- Tests of the digital solution for technical validation;
- Usability and acceptability questionnaires;
- physiological questionnaires;
- Adverse events;

- Log files registration;
- Semi-structured interviews with users.

Phase 5

- Tests of the digital solution with real users in a residential care home;
- Usability and acceptability questionnaires;
- physiological questionnaires;
- Psychosocial questionnaires;
- Critical incident registration;
- Performance evaluation;
- Log files registration;
- Adherence rates evaluation;
- Semi-structured interviews with users.

5.4.2 Planning of evaluation

MAST

The MAST (Model for Assessment of Telemedicine) framework was used to evaluate the effectiveness and contribution of UC-PT1-004 to quality of care. MAST is described as a multidisciplinary process that summarises and evaluates information about the medical, social, economic and ethical issues related to the use of telemedicine.

A review of the seven dimensions of MAST revealed that two of the seven multidisciplinary dimensions/domains were of specific relevance to the pilot of UC-PT1-004. These were Clinical Effectiveness and Patient Perspectives. Table 124 contains the data required for the MAST evaluation.

Table 124: UC-PT1-004 MAST

MAST Domain	Topic	Outcome	Data required	Time point
Clinical Effectiveness	Effects on mortality	Were not measured		
	Effects on morbidity	Were not measured		
	Physical health	Were not measured		
	Mental health	Psychosocial and psychological wellbeing	WHOQOL-BREF	Baseline, end of pilot, 3-month follow up

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			GSES	Baseline, end of pilot, 3-month follow up
			OSSS-3	Baseline, end of pilot, 3-month follow up
			UCLA v3	Baseline, end of pilot, 3-month follow up
			SPANE	Baseline, end of pilot, 3-month follow up
	Effects on health related quality of life	Health related quality of life	EQ-5D-5L scores	Baseline, end of pilot, 3-month follow up
	Behavioural outcomes	Were not measured		
	Utilization of health services	Were not measured		
Patient perspectives	Satisfaction and acceptance	User Experience	UEQ-S scores	End of pilot
		User acceptance	TAM score	End of pilot
	Understanding of information	Usability of application	SUS scores	End of pilot
	Confidence in the treatment			

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	Ability to use the application Access & Accessibility			
	Empowerment Self-efficacy	User engagement	Number of logins	During pilot
			Used functionalities	During pilot
			Time using robot	During pilot

MAFEIP

Due to the evaluation methodology (small-scale deployment, non-case controlled) the MAFEIP tool was not used to evaluate UC-PT1-004.

5.4.2.1 Final check of the use case by using the CSFs of MOMENTUM and the NASSS framework

MOMENTUM

The MOMENTUM blueprint was applied to check if UC-PT1-004 had the critical success factors (CSFs) needed to take it from the pilot phase to large-scale deployment. The outcome of the process can be found in the Annex 49. Details of each CSF are provided below.

CSF 1. Cultural readiness for the telemedicine service

According to interviews in mock-ups, patients of CH are willing to share activity data with them. Patients usually accept new technologies as far as they have a clear benefit.

Care providers at CH already use ICT in their daily work. CH has a flexible operational framework and is aware of the importance of incorporating cost-effective digital solutions. ICT is at the strategic core of the company. CH has constant talks with their patients and health workers about the potential benefits of incorporating new ideas/solutions.

Financial strategy has to be developed.

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CSF 2. Advantages of telemedicine in meeting compelling need(s)

CH core business is to provide home care, where telemedicine solutions are seen as the technologies which enable the business model. The robot is seen as a tool for constant interaction with the patient, and its social side is an element poorly managed in current services for older adults. However, the social robots as companions to alleviate isolation and promote social activities is still a research area, where more data is needed to optimise the type of interaction required for such goals.

CSF 3. Ensure leadership through a champion.

The CEO of CH has already promoted the internal deployment ICT solutions.

CSF 4. Involvement of health care professionals and decision-makers

The CEO and medical team of CH have been involved in the definition of the functionalities. In addition, interviews in all phases were carried out with health care staff at residential care home Ca’n Granada.

CSF 5. Put the patient at the centre of the service

Older adults' representatives of final users have been involved in all phases.

The objectives of the use case are to promote social activity and active healthy ageing. Studies show that older adults who stay socially active and engaged experience a variety of benefits, both in physical and psychological health.

CSF 6. Ensure that the technology is user-friendly

It is the objective and great effort is made within the SHAPES consortium to define requirements to present the robot as user friendly as possible to older adults. Half-day training was sufficient as well as a follow-up of older adults to check their adaptation.

CSF 7. Pull together the resources needed for deployment

The resources required for deployment of the digital solutions for the pilot are available thanks to SHAPES funding and internal resources already allocated. The technical partners of the use case provide all IT competencies.

CSF 8. Address the needs of the primary client(s)

Older adults, relatives and caregivers are the potential clients, as a tool to promote social activity and combat isolation of older adults. Caregivers benefit from the use of this tool as helps them to communicate with older adults and control some health aspects.

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Health care providers are potential clients, as a tool to broaden their service by offering social stimulation and as a system that detects some emergency situations, such as temperature.

Care residential homes are potential clients, as a tool that participates in the organization of daily tasks (agenda, alerts, short messages …) and as a system that detects some emergency situations such as temperature.

CSF 9. Prepare and implement a business plan

A business plan for the solution was developed in D7.3 SHAPES Business Plan WP7.

CSF 10. Prepare and implement a change management plan

It will be evaluated after the end of the project.

CSF 11. Assess the conditions under which the service is legal

The service is legal under the required CE and AEMPS certifications. No further certification is needed for the pilot.

CSF 12. Guarantee that the technology has the potential for scale-up

To do after pilot. Scaling up of the robot manufacturing is a complex process and needs to be evaluated along with the cost-efficiency analysis.

CSF 13. Identify and apply relevant legal and security guidelines

GDPR has been applied. The system provided implements with all security and privacy related regulations.

CSF 14. Involve legal and security experts

CH worked with SHAPES partners to implement a data management plan, particularly because we dealt with health data. We worked with LAUREA, with extensive expertise in this field, with VICOMTECH, who was awarded with the ISO 27001 certification for information security management and with HMU who has extensive expertise in IT infrastructure security.

CSF 15. Ensure that telemedicine doers and users are privacy aware

Health care professionals at CH already worked with data protection protocols. They have also been instructed the application of data protection with the new technologies introduced in the pilot. Older adults and informal caregivers were informed about data collection and processes and consents was collected.

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CSF 16. Ensure that the information technology infrastructure and eHealth infrastructure are available

All parts of the infrastructure are provided by SHAPES partners within the SHAPES platform.

CSF 17. Put in place the technology and processes needed to monitor the service

The deployment and maintenance team fixed any bugs or issues during the pilot. The team is composed by technicians at CH and PAL. CH, PAL, VICOM, TREE and OMNITOR are the owners of all the software that has been used in the pilot. We made use of an external video-conferencing solutions that complies with GRDP. This means that we don't have any software dependencies with third parties, and that we can fix the source code at any point. Moreover, the system logs all activities so any incident can be identified and solved quickly.

Apart from the user manual, we have access to the software developers of the system so in case of doubts or questions we can answer them directly. Participants had direct contact with CH during the pilot and each of them had a previous relationship with CH, assuring a smooth communication.

CSF 18. Establish and maintain good procurement processes

All technologies in current version of the technology come from SHAPES partners. Standard local procedures which comply with all the required regulations have been followed for the procurement of devices.

NASSS

The NASSS framework was used to detect areas of complexity in the project plan for piloting UC-PT1-004 and, when needed, to make adaptations to the plan. The short version of the NASSS-CAT was considered and completed by the pilot team (see Annex 50). Of the six domains, there was one domain in which significant complexities were identified that, if not mitigated or addressed, were likely to affect the project's success at the piloting stage of the use case.

At the time the NASSS framework was applied there were significant uncertainties identified in the technology domain. These were:

- The technology: Many interdependencies were developed. Bugs and crashes are expected. Resources are allocated but constant checks are needed to keep developing times.

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- The value proposition: The high cost of the robot needs to be carefully evaluated in a cost-effective analysis after the pilot. This probably affects commercial deployment in the near term.
- The intended adopters: The type of homes (size of rooms, presence of furniture) may greatly affect a wide implementation of the technology.
- The organisation: A big initial financial investment is needed by the health provider to deploy the technology commercially. This must be analysed, along with the cost-effective analysis, at the end of the pilot.
- The external context: Regulatory context needs to be further evaluated.

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5.5 Phase 1

5.5.1 PACT and FICS Scenario

PACT

Table 125: UC-PT1-004 PACT Scenario

Applicable SHAPES Persona	Ernst (P1), Roberto (P2), Ayesha (P3), Isabelle and Marco (P4, especially needs of care giver), Helena (P7)
Applicable SHAPES use case	UC-PT1-004 - Robot to Support Older Adults to Live Independently and Remain Socially Connected
Point of contact (pilot site)	Clinika de Kay (Clinica Humana, CH)
Point of contact (technical provider)	PAL Robotics (PAL)
People Roles and/or actors of typical users involved in delivering and receiving the telemedicine intervention	• Older adults, 65+ years, care recipient, living independently in their own home in urban environments or in residential care homes. They usually live alone or with their spouse and are visited or supervised by a family member or caregiver on a regular basis. They will have none too little level e-literacy and in some cases access to smart phone. • Caregiver: they could be relative(s), will have moderate level of e-literacy and access to a smart phone/computer.
Activities Activities to be performed by the actors in order to successfully provide and receive the telemedicine intervention procedures for the professional and the patient; Parameters that determine the measures used in the intervention	**Older adult / care receiver** • Interact with digital assistant on a daily basis • Start a specific type of interaction • Check the agenda to see the daily events • Send short messages to caregiver or health professional • Check body temperature • Play entertainment games such as solitaire or puzzle • To make and receive videocalls • Answer satisfaction survey for direct satisfaction assessment with regards to digital assistant **Caregiver** • Update the agenda of participants to be displayed by the robot • Receive short messages from participants • Support older adults to use the robot ARI

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	• Report any incident to the technical team at CH
Context Social-medical relevance of the telemedicine intervention; privacy issues; risks for the patient; locations	Digital assistant was installed in a residential care home to assist participants in their daily living activities. An interaction protocol (interaction [language or noise], date, time) was at disposal of caregivers. One of the key goals was to enable the independence of older adults and to achieve independence. Older adults often need assistance to remember appointments or to make/solve certain basic actions, such as sending a message or remembering medical appointments. Another important issue is that they are at risk of isolation, for this reason, communication and social engagement must be reinforced/sustained. All of these can be pursued using a socially assistive robot that through verbal and non-verbal communication supports older adults to perform daily activities. The robot ARI moves its arms, head and eyes and offers touch-screen tablet experience in order to enrich the interaction. Moreover, maintaining privacy of data is of the utmost importance. An identification list (including name and date of birth) will be held at the local pilot site. GDPR and ethics are in line with WP8, and all servers are located within the EU The pilot was developed in the Spanish language at the location of Mallorca, Spain.
Scenario: *Older adult* Helena is an 82-years old woman who lives in her own independently. She has a caregiver but only visits her few days a week (2-3). She is regularly visited by her nephew. She has chronic conditions, such as vascular insufficiency, atrial fibrillation, advanced cardiovascular disease with thrombosis in her legs and has some trouble walking (she is slow and gets tired). Despite all this, in general terms, her health is good. She likes being autonomous and doesn't like bothering her family and feeling like she's a burden to them. She likes being busy. However, she spends a lot of time alone and would like a companion that helps her being active and suggests social activities. Helena usually wakes up at 7.00h in the morning. She prepares her breakfast and normally likes to listen to the news and/or would like to know the activities in her area and her scheduled activities. She approaches the robot ARI, the digital assistant, that is placed in the kitchen, and a typical scene would be like this:	

- ARI: “Good morning, Helena! I’ll measure your temperature.” (directions pictured on the screen).

- ARI: Good! Your temperature is normal” (If temperature is abnormal, it will send a message/alert to FAMILY-COVID-19 measure).

- ARI: “Would you like to check your agenda to see today’s events?”.

-Helena: “Yes, agenda please”.

- ARI: “Today you have a call appointment with Dr. Karina at 11.00h. You need to buy your MEDICATION. Also, it’s the birthday of your friend Asunción!”.

- Helena: “Thank you”.

- ARI: “Do you need anything else? Remember that you can send messages, make a videocall, play a game....

- Helena: ”No, thank you”.

The morning is long, and Helena is bored.

- Helena: ”I want to do something”.

- ARI: “Would you like play a game, for instance a solitaire of a puzzle?”.

- Helena: ”Yes, please, a puzzle”.

Helena makes two puzzles with ARI.

- Helena: “ARI, call Asunción”

- ARI: “Sure!”, and call starts.

Helena wants to have beef lasagna for tomorrow’s lunch, but she realizes that there is no minced beef.

- Helena: “ARI, send a message to my caregiver”

- ARI: “Hello Helena, what message do you want to send?”

- Helena: “Buy minced beef.“

- ARI: “Ok, message sent to caregiver. Do you want to do anything else?”

- Helena: “Yes, I would like to videocall my sister please.”

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<table>
<tr><td colspan="2">

- ARI: “Sure”

Helena makes a videocall with her sister, who is in Helena’s contact list.

<u>*Caregiver*</u>

They will have access to the panel to schedule social activities, set up the agenda and set predetermined messages.

</td></tr>
<tr><td>

Technology

Type of information / parameter that are relevant in monitoring the health status; type and frequency of accessibility of information; feedback modalities (communication***)***

</td><td>

Older adult / care receiver

- Full name
- Telephone number
- Address of residence
- Email
- Age
- Gender
- Years of formal education
- Data to complete questionnaires (WHOQOL-Bref [1], EQ-5D-5L [2], GSES [3], OSSS-3 [4], 1-item HLM, Participation questions, SUS [5], TAM [6], UCLA 3 [7], SPANE [8], Gijón [9], EQS-short [10], open interview)
- Information added to agenda, messages and contact list.
- Temperature output
- Biometric data: Emotion recognition, videocall.

Caregiver

- Full name
- Telephone number
- Email
- Data to complete questionnaire (SUS, open interview)
- Incidence reporting

Robot data

- Log information of the running applications (info, warning, error messages).
- Statistics information about motors, disk, cpu, ram usage.

</td></tr>
</table>

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FICS Scenario

Table 126 collects the technical partner elements used in PT1-004.

Table 126: UC-PT1-004 FICS Scenario

Function and events *Functionality of the intended system which is capable to realize actor's activities*	The system will offer to the older adults the robotics devices and the functionality to: • Detect and monitor temperature • Establish a video call • Send messages to caregivers or health professionals by SMS or email • Agenda • Remind users of different events • Entertainment games
Interactions and usability issues *User-system or system-component interactions meditating actor's activities; Types of the interactions, e.g. unidirectional data streaming service or reliable messaging service*	In this user case we have two types of users: - Older adults - Caregivers The older adults will approach the robot and choose what to do through verbal or touch-screen interaction with ARI: check temperature, make a videocall, send a message, check the agenda and reminders, entertainment options. The caregiver will be able to add new events to the agenda and predefined messages to be visualised by the older adults. They will also be able to establish calls and receive notifications from the robot (too high a temperature, message). They will also be able to visualize and monitor the status of the robot (battery level, camera output, etc).
Content and structure *Variables of the interaction*	The older adult's front-end will be the ARI robot, as well as its integrated front touchscreen (Ubuntu) and back Android tablet, which can be retrieved from the robot's support. The interaction will use speech, gestures as well as the touch-screen interface. The caregivers will interface through the robot's Web GUI interface, where they will be able to also add new touch-screen content for the robot.

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<table>
<tr>
<td>Style and aesthetics

Look and feel of the system</td>
<td>


Figure 24. UC-PT1-004 Robot ARI

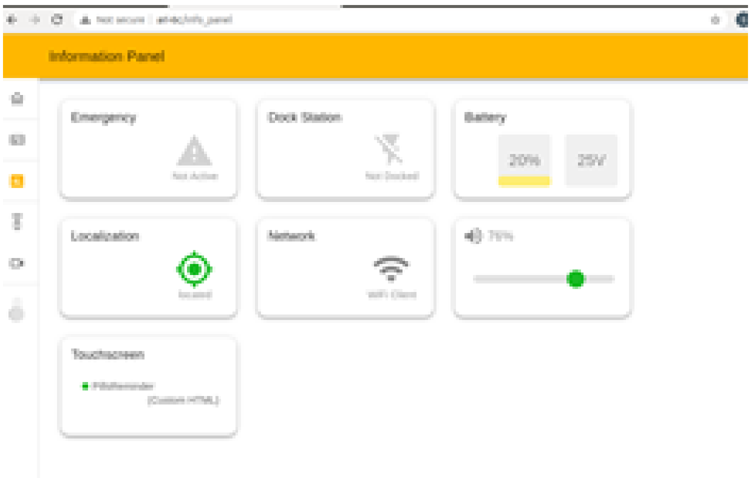

Figure 25. UC-PT1-004 Web GUI interface

The robot offers multimodal behaviour by enabling interaction with the tablet, but also combining it with speech interaction, change of LED effects, expressive gestures with the arms and head, and animated eyes.
</td>
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</table>

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Figure 26. UC-PT1-004 Touch screen interaction

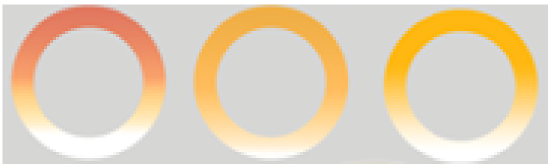

Figure 27. UC-PT1-004 Led effects

Figure 28. UC-PT1-004 Animated eyes

5.5.2 Key performance indicators

Key Performance Indicators (KPIs) are defined as a set of measures that focus on the most critical factors to a project's success. KPIs are measurable and quantifiable with a target or threshold. They measure a performance in critical areas by showing the progress or lack of it towards realising the objectives of each specific use case. The following KPIs have been chosen to determine whether, or not, the pilot for UC-PT1-004 has been successful.

Failure to meet four or more of the KPIs (out of seven) indicates that repetition or major revisions to the use case and associated digital solutions are needed before entering further development oriented to commercialisation.

<u>Recruitment and retention</u>

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- At least 80% of the target cohort (older adults) were successfully recruited into the pilot during the recruitment period.
- At least 75% of recruited participants within the target cohort remained enrolled in the pilot until the end of the study.

<u>Technical performance</u>

- There is no re-start of any of the components of the technology for at least 90% of the days.
- Less than 2 technical incidents reported per week.

<u>User engagement and acceptance</u>

- The overall user experience quality of the robot as measured using the short version of the User Experience Questionnaire (UEQ-S) was classified as ‘Excellent’, ‘Good’ or ‘Above average’ based on published benchmark data.
- At least 50% of the older people interact with the robot 50% of the days.
- Caregiver scored above average rating (>68) in the System Usability Scale (SUS).

5.5.3 Timeline of pilot activities

The original timeline of pilot activities according to the Description of Work was to conduct Phase 1, 2 and 3 between May 2020 and September 2021, then Phase 4 in November 2021-April 2022 and Phase 5 between May 2022 and March 2023. Phases 1, 2 and 3 took place as planned, however, Phase 4 was delayed due to technical issues that needed to be solved before proceeding to the technical validation and it was conducted in January 2023. These technical issues had to do with the integration of the different solutions, the authentication of users with ASAPA, the data flow infrastructure between the digital solutions and the Data Lake and the chatbot development. Then, Phase 5 was conducted in May 2023 in the residential care home La Porcíncula. The planned and actual timeline is shown in Figure 29.

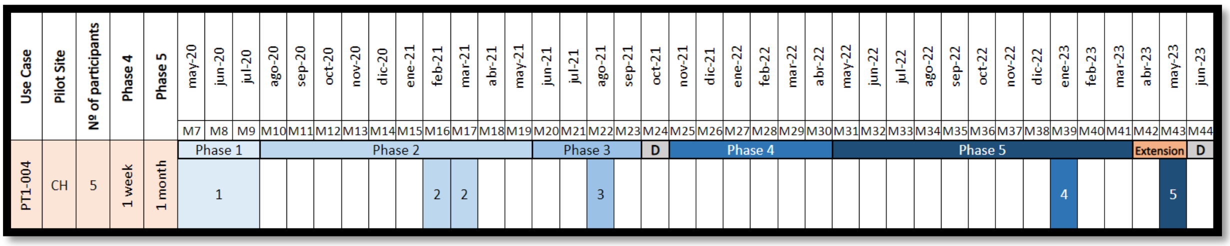

Figure 29: UC-PT1-004 Timeline of pilot activities

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5.6 Phase 2: Testing of mock-ups and prototypes

5.6.1 Methodology of testing

The aim of Phase 2 was to validate the functionalities of technologies in UC-PT1-004 and the way they were planned to be implemented, including the interaction with the users, based on the feedback collected from participants. In addition, this research study also aimed to collect new functionalities. The outcome of this research study provided technical partners with the opportunity to integrate user feedback at an early stage of the technological development process.

During this phase, the robot ARI and related assisting technologies for UC-PT1-004 underwent a co-design and user-testing process to validate the functionalities offered and their usability. Mock-ups of the robot, its behaviour while the functionalities are in use and the agenda/reminder/activity programming interface were shown to participants:

- Robot and its functionalities: older adults
- Agenda, predefined messages and videocall interface: caregiver
- Maintenance and potential incidences: technical assistance unit

Feedback on how the current functionalities solved their needs, usability comments and ideas for new functionalities were sought. All study activities were conducted remotely in the format of slide presentation and semi-structured interviews.

Recruitment

<u>Participants</u>

This research study was conducted in three different types of user groups:

- Oder adults: 1) ≥ 65 years old; 2) they are independent, although they may receive caregiving some hours a day; 3) living at home (it could be a residential care home); 4) have access to internet connection. At least 2 people were expected to be recruited.
- Caregiver: people with regular contact with the older adult and willing to build the agenda, predefined messages and support the older adult with the use of the technology. At least 1 person was expected to be recruited.
- Receptionist/Managers at the residential care home: personnel at this type of sites with knowledge about how reception interacts with their users. At least 1 person was expected to be recruited.

<u>Identification of participants</u>

- Older adults: Eligible participants were identified among users of CH.

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- Caregivers: Eligible participants were caregivers of older adults or personnel at CH.
- Receptionist/Manager at residential care home: Eligible participants were identified among personnel at Ca'n Granada (residential care home).

Informed consent procedure

Eligible individuals were provided with a participant information sheet explaining the background and purpose of the study and what they could expect to happen if they agree to participate.

Those who agreed to take part were given a consent form by personnel of CH. Signed consent forms and contact details were then handed over to CH personnel to proceed with the study activities.

Informed consent for all participants were taken with the following accepted forms of signatures:

- Physical handwritten signature
- An electronic representation of a handwritten signature

The informed consent signed by participants was signed by the SHAPES manager at CH to acknowledge reception and a physical or electronic copy of the document was provided to the participants by personnel of CH.

Method

Presentation of mock-ups

Validation was sought on the utility and usability of:

- Robot and assisting technologies functionalities
- Interface for agenda and predefined messages and videocall

In addition, the presentation allowed users to propose ideas for new functionalities.

Remote sessions were conducted with participants via video call. A PowerPoint presentation was shown via screen share during which participants were presented with brief background information about the SHAPES project and an overview of the purpose and functionalities of the UC-PT1-004 technologies. Mock-ups (images, videos and text descriptions inserted in the presentations) of functionalities were then presented to participants.

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Figure 30. UC-PT1-004 Screenshot of one of the videos used in the mock-up sessions. Videos were made by PAL.

After each functionality, the SHAPES manager at CH asked participants questions about the utility of the functionalities according to their needs in several scenarios. These questions were a combination of open and closed questions designed to obtain both general and specific feedback about the functionalities. Some questions required an evaluation from 1 to 5 and others required to rank several options. In the case of older adults, they were given cards to do these actions physically if they preferred so.

The PowerPoint presentation files are included in Annex 51, Annex 52, and Annex 53 for older adults, caregivers and personnel at the residential care home, respectively.

Participants were given a copy of the slides with the notes taken by personnel of CH. They were told to review the notes and send more feedback, corrections or clarification within 15 days if they have time to do so (they had the contact details at the last slide).

The following number of sessions, and time length, was expected:

- Older adults: 2 session, 45min each. The second session was scheduled at the end of the first session.
- Caregivers: 1 session, 2h
- Receptionists or Managers at the residential care home: 1 session, 1h

<u>Data collection and analysis</u>

Notes were taken during the interview by personnel of CH. A report was elaborated to include a table listing all questions and filled with participants answers. Similar questions throughout the different types of users were grouped together. Other comments and opinions collected at the interviews were posted after the table or within a particular cell if the information is related to the question. Completed reports and collated findings, including any recommendations, were presented to technical partners.

5.6.2 Results of testing

The Phase 2 mock-up presentations with recruited participants (2 target users and 4 health care professionals) were conducted between 25th February and 30th March 2021. Presentations were conducted remotely via the Google Meet video conferencing platform. Notes were taken during the session and shared, after removal of personal data, with partners. Table 127 below shows a summary of the user's comments.

Table 127. UC-PT1-004 Feedback from older adults/caregivers in mock-up presentations

Feature	Caregiver representing older adult (daughter)	Older adult	Caregiver (CH)	Caregiver (Ca'n Granada)
Age	88	82		
Caregiver?	Daughter, living together	3 times a week		
Position			Doctor	1) Receptionist /customer service, 2) administrative help, 3) manager
Years of experience			4.5 years	1) 2, 2) <2, 3) 8 (years)
REMINDERS				
Robot approaches to make a reminder (1-5)	4	5		
Do you think older people would like to have reminders?			4	Not included in the presentation (they weren't thought to act as caregivers), but they liked the idea. See below.

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Type of reminders	Drinking water > medication > social events > medical appointments > hairdresser's appointments > anniversaries	Anniversaries > Medical appointments	Medication -5, regular Anniversaries -5, punctual Medical appointments -5, punctual Social events - 4 (not sure), punctual Other: meeting friend, family; meeting for lunch, watering plants, feeding pets, vet appointments	To call family, to take medication, anniversaries, hairdresser's appointment, medical appointments
Do you want to program reminders?	YES	YES	YES	YES
How many regular reminders?			6-10 (but if every drug is one, >20)	
How many punctual reminders a week?			6-10	
Do you want to receive acknowledgment of reception of reminder?			YES (in important ones)	YES
Do you want CH to program reminders?	YES	YES		
Do you want a person of trust to program reminders?	YES	NO		
Reminder: person of trust	Daughter	NA		
Reminder: person of trust skilful with computer	YES	NA		
SUGGESTIONS				
Robot approaches to make suggestions	4	4	4	
Type of suggestions indoors	Meals (older person don't feel like cooking), call delivery for	None	TV programs watering plants	

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	food/special dish, movies on TV, a medication if humidity rises			
Type of suggestions outdoors	Doesn't know	None	Social house (dance, cards) walks Nordic walking gym week market	
Do you want to program suggestions?			There should be a specific person in the team	Not included in the presentation (they weren't thought to act as caregivers), but they liked the idea. Although they focus on center activities.
How much time you have a week to program suggestions?			2-5h	
ACTIVITIES WITH ARI				
Would you like to do activities together with ARI?	4	4		
Games	1	2nd preference	4	
What games?	NA	Rummikub > Parchis, Solitario	Domino, Memory	
A lot of games or just 1-2?	NA	1		
Exercises	1	3rd preference	5	
Showing videos of exercises	4			
Pictures	1	1	4	

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Listening to radio	5	1	5	
Listening to music	5	Most preferred	4	
Videos	1	1	3	
Listening to news	5	1	5	
Listening anything in another language	1	1	1	
What would you like to listen in another language?	NA	NA		
Other activities	ARI reads news, a story, a book To go with ARI for a walk outside	To go with ARI for a walk outside, dish washing	Dancing videos, recipes videos, cooking videos, dessert (anniversaries) videos, music while doing exercises	
Would you like ARI to talk a lot, encourage you while doing activities?	A little to give company, not too much	Quiet, only when playing games		
Do you have time to upload videos, pictures?			4	
Do you have material to upload?			Pictures 2 Music 1 Videos 1	
COMMUNICATIONS				
To call with ARI	5	5	1	5
Videocall with ARI	5	5	5	5
Who starts the call?	Any	Any	Only doctor	Any
Would you change your calling system?				3 (call needs to be good quality)
Who would you like to call?	Friends, Family, Doctor	Family, Neighbor, Doctor		Users of apartments
To receive messages	4	5	4	1

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To send messages	4	4	5	3
How would you like to send/receive messages?			Specific App > WhatsApp > SMS > Mail > Computer	Receptionist (mail) Others: WhatsApp
To write messages with tablet or by voice?	VOICE	VOICE		
Does the older adult have any advantage by calling through ARI?				5
SHOPPING LIST				
To tell ARI to annotate items in a shopping list	5	1		5
Shopping list of medication	1	1		5
Would you like to send the list to someone of trust?	5	NA		5
Who would you like to send the list?	Daughter (not sending, telling)	NA		Receptionist
Does this person have email/smartphone?	YES	NA		YES (mail is preferred, they have ResiPlus software, which manages shopping lists, but they don't use it)
Separate shopping lists?	YES	NA		YES
Other types of shopping lists?	Doesn't know	None		Pharmacy (with medication)
TEMPERATURE				
Would you like to have your temperature taken by the ARI?	5	5		5
Would you like ARI to take the temperature to your visitors?	5	1		

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Would you like ARI to send and alert if your temperature is high?	5	5	5	5
Who would you like to send an alert if your temperature is high?	Doctor	Doctor		Receptionist
FALLS				
Would you like ARI to patrol to detect falls?	5	5 (to make clear the robot is patrolling)	5	5
What time would you like ARI to patrol?	4am, every 6 h	once in the morning, once in the evening		
Would you like ARI to alert someone if it detects you have fallen?	5	5	5	5
OTHERS				
Types of HOW TOs	Recipes, radio frequencies of radio channels, some TV commander functionalities (mute)	How to call with Tablet		Not included in the presentation but came out in the conversation: * PIN of cell phone
Would you like ARI to make you quick health-related questionnaires?	5	4	5 (how did you fall do you feel alone? Likert style with faces)	
Would you like a questionnaire to confirm an activity is done?			5	
Would you like a questionnaire to confirm if the activity is enjoyed?			5	
Are there any situations (other than falls or temperature) in which	Any emergency, SOS call (ARI could ask	SOS When she is not feeling well	No interaction with robot Medication not taken	Difficulty to speak Mouth twists

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you would like ARI to alert someone?	after call: are you ok?)			(both for ictus)
Who would you like to receive the alerts?	Doctor	Doctor Neighbor		
How would you like to receive the alerts?			Specific App > Mail > WhatsApp > SMS > Computer	
Would you like someone to watch and listen to you through ARI in case of alert?	5	5	5	5
Would you like ARI to offer you hydroalcoholic gel?	4	3		
Would you like ARI to offer your visitors hydroalcoholic gel?	5	3		
Do you like the idea of having ARI rolling around your house?	"No problem"	"I guess, not sure"		
What dependencies would you like ARI to navigate?	All	Living room, kitchen, bathroom (when door is open), TV room, garden (bedroom is upstairs)		
What dependencies would you like ARI NOT to navigate?	None	None		
Gender ARI's voice	Indifferent	Female		
Do you think that the size of ARI is correct for the dimensions of the home? (1 person in the apartment)				5
Do you think that the size of ARI is correct for the dimensions of the home? (2 people in the apartment)				5

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Do you think that the size of ARI is correct based on the furniture distribution?				3
Can you picture a robot in your house?	3	3		
Do you think the robot will be useful?	3	4		
Do you think you are going to use the robot a lot?	3	3		
Do you think ARI will make you feel safer as it will assist you in your daily life?	4	4		
Will you interact more with tablet or using the front-screen?	It depends	It depends		
Will older people interact more while sitting or standing?				It depends
Have you used a tablet before?	NO	YES		
Do you feel comfortable using a tablet?	NA	3		
General impression of ARI	4	3		
COMMENTS				
Other users	Daughter would like to use the robot for some functions (e.g. shopping list)			
Other measurements	O2sat, BP, HF. O2sat			
Co-living	Daughter, two cats	Alert is set up at nights		
ARI's voice	Should be tender			

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Other features	To ask about the weather, answer should include humidity.		Back tablet is a good idea. Older adults can be as short as 1.5 m Important regular reminders In physical exercises, screen should be off to avoid distractions.	To have confirmation user has read message ARI sets questionnaire for menu (once weekly).
House distribution		Room is upstairs.		
DATA PRIVACY				
Would you mind that we collect data about the activities you do most to make statistics?	1	1		
Would you mind that we collect data about the activities you like most to make statistics?	1	1		
Would you mind that we collect data about the time and duration of the activities you do to make statistics?	1	1		
Would you like to monitor what the older adult does?			4, but just to check occasionally; how long the older adult interacts, times for every activity.	5, 1 report every 1-2 weeks. To include activities, if reminders were carried out.
Do you mind that we collect data of your face for the recognition?	1	1		

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Do you mind that we collect data on your shopping list as we need to share it with the people you decide?	1	1		
Do you mind that we collect data on your shopping list (medication) as we need to share it with the people you decide?	1	1		
Do you mind that we collect data about detections to alert someone?	1	1		
If within an alert context, ARI asks you to confirm and you don't answer, would you like to turn on camera/audio so someone you have assigned previously want to watch/see**? Think that ARI can make mistakes**	1	1		
If within an alert context, ARI asks you to confirm and you don't answer, would you like to turn on camera/audio so someone you have assigned previously want to watch/see**? Think as if ARI was perfect**	1	1		
Would you like other people to know what you are doing with ARI?	1	1		
TECHNOLOGY SKILLS				
Do you like new technologies?	YES	NO		
What new technology devices do you have?	None	Tablet, smartphone		
If you have any, how often do you use them?		Daily, also tablet (to play games)		

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Internet communication tools	Video calls, but daughter sets up everything	Smartphone - WhatsApp		
Have you ever used a digital assistant?	NO (daughter once)	NO		
What digital assistant have you used?	NA	NA		
If you have used a digital assistant, how was the experience?	NA	NA		
Brief explanation of your experience with digital assistant	NA	NA		
If you every used a digital assistant, select the sentence that best described your thoughts	NA	NA		
How do you communicate best with new technologies?	NA	Voice		

Feedback collected from participants was carefully analyzed and discussed with technical partners involved in this use case. Preferences on types of activities, interaction methodology, etc. were implemented. However, it was not possible to address all demands. For instance, some participants declared that they would like to use the robot ARI outdoors but, even if this was discussed with PAL, for safety and hardware specifications, the robot can only be operated indoors. We will see in the next chapters that some functionalities presented in the mock up presentation, such as navigation and fall detection, were not piloted in the final phase due to two different reasons, first, for security reasons, as it was not possible to cover the risk of ARI navigating around older adults in a research study, and second, because of space limitations.

Mock up presentations helped to include and reinforced demanded functionalities by end users but also to realize about the challenges to be faced in this use case, which will have to be also considered after the finalization of this project.

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5.7 *Phase 3: Hands-on Experiments*

5.7.1 Methodology of hands-on experiments

The aim of hands-on experiments was to collect feedback, especially regarding user experience, from end users by giving them the option to test the technology to be deployed in the use case PT1-004 in a prototype version, the robot ARI and the functionalities offered.

Recruitment

Participants

Phase 3 hands-on was expected to be conducted with at least 5 target users of ARI (i.e., ≥ 65 years' old). Gender equality was sought in the group of older adults' participants. Participants (older adults, aged 65 years old and over) were invited to face-to-face sessions with CH personnel to take part in the hands-on experiments. A group session was organised with users of Ca'n Granada (residential care home, Mallorca, Spain); managers were also invited. Moreover, the robot ARI was taken to an older adult's private home to test this technology in a different setting.

Identification of participants

- Older adults: Eligible participants were identified among users of CH.
- Caregivers: Eligible participants were caregivers of older adults or personnel at CH.
- Receptionist/Manager at residential care home: Eligible participants were identified among personnel at Ca'n Granada (residential care home).

Informed consent procedure

Eligible individuals were provided with a participant information sheet explaining the background and purpose of the study and what they could expect to happen if they agree to participate.

Those who agreed to take part were given a consent form by personnel of CH. Signed consent forms and contact details were then handed over to CH personnel to proceed with the study activities.

Informed consent for all participants were taken with the following accepted forms of signatures:

- Typewritten
- Physical handwritten signature
- An electronic representation of a handwritten signature

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The informed consent signed by participants was signed by the SHAPES manager at CH to acknowledge reception and a physical or electronic copy of the document was provided to the participants by personnel of CH.

Method

Before the hands-on training with participants, personnel of CH performed some tests of the different functionalities in order to ensure the correct operation of the technology.

Hands-on training at Ca'n Granada and at an older adult's private home

ARI was presented as a functioning prototype. The SHAPES Project Manager at CH guided participant through a series of steps and tasks to show the different functionalities of the robot. Instructions were given with the support of a presentation. A planning of the session can be found in the Annex 54.

The steps and tasks included:

- Log-in process and reminder/suggestion of activities
- Videocall
- Entertainment games
- Sending pre-defined messages
- Temperature measurement
- Remote navigation control by health professionals
- Commented but not shown (still under development and idea validation):
  - Menu, shopping list
  - Internet access
  - Calling ARI by tapping an icon on cell phone

The pace of the session was determined by participants. After each point of the demonstration, participants were encouraged to use ARI following the same process, with the presenter still present and available to be asked questions and troubleshoot any issues.

Feedback was collected at any time of the session by SHAPES project manager at CH, who was also the presenter. A concurrent 'think out loud' approach was used to collect reactions to ARI or marketplaces and identify any areas that required particular attention. Participants were encouraged to verbalise their reactions, thoughts, feelings, and opinions about the prototype throughout their engagement with the presenter. Notes were taken by the presenter.

Data collection and analysis

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After the session, a completed report, including practical recommendations, was elaborated by the SHAPES Project Manager at CH and presented to and discussed with technical partners involved in this use case.

5.7.2 Results of the hands-on experiments

Phase 3 hands-on experiments was conducted in August 2021 with older adults and caregivers, where ARI was physically presented to participants for the first time.

On the one hand, ARI raised interest among people, including older adults. People instinctively tried to interact with the robot, through the tablet and by voice (even though this functionality hadn't been implemented yet). They expected to have small talks, probably, just for fun. A tablet pencil was very useful for some people to reach out the front screen, particularly if they were sitting or on a wheelchair.

On the other hand, ARI was usually seen as too big, and some people felt scared of interacting with it. We overseed that an accommodation time was needed, probably in close contact with a reference guide who would instruct and support the older adults during the first days. Some people didn't feel comfortable with the eye movement and would prefer static eyes or even shutting them down.

Missing features. Important features were still missing during the hands-on experiment:

- Voice interaction
- Face (individual) recognition
- Set up of reminders, lists

Internal tests at CH

<u>Navigation</u>

Navigation function worked well once the mapping was done properly and allowed/forbidden spots were defined. While moving, ARI identified if there was a person in the way and stopped. The mapping at CH was done with the lights on. When the lights were off (but with enough natural light for a person to see), ARI crashed with some edges (steps). While ARI was rotating (only checked when docking), person detection was not functioning, resulting in blind spots if someone was nearby. To avoid this, the robot should verbally indicate its intentions to be given enough space and the area around the dock station was marked by a safety range.

At the configuration state, ARI had to be taken to a point in front of the dock station before the 'dock' command was launched. Otherwise, ARI wouldn't go to find the dock station, and stayed at the initial spot, turning around, looking for the docking station picture, visibly lost. When this happened, we had to block ARI and sometimes restart.

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Detached house/Individual home scenario:

- Potential candidate had an outdoor terrace (with roof) where she spent time. There was a small step to go inside/outside the house. We discussed it could be overcome with some thin woods. ARI instructions specifically say that ARI must be indoors, so this was discussed with PAL who had to confirm/reject the use of ARI outdoors in the contract or equivalent.
- Light (and other) conditions had to be checked before navigation starts.

Residential care home:

- At that stage, the use case was defined as ARI co-living with the older adult. Informal opinions gathered during our visit at the residential care home revealed that it might be too intensive, and that ARI would be underused. It was suggested to redesign the use case in a way that the robot was used only a few hours a day by each older adult inside their rooms and that the rest of the day ARI was in the hall performing tasks such as providing information about week activities, registering menus and so on. CH team started working in redefining the plan.

We will see in the following chapters that navigation function was not implemented because the pilot was conducted without the navigation option for security reasons.

<u>Touchscreen</u>

Technical team at PAL and CH discussed about how to edit and readjust the touchscreens to be displayed by ARI. This process was understood correctly.

<u>Programming ARI to speak and react with gestures</u>

It was easy to program ARI to say sentences out loud. This can be done by the technical team and end users can be also trained to do it.

<u>Defining gestures</u>

Program ARI to perform new gestures with its head and arms was supposed to be relatively easy, however, this feature was not available at the time of the Hands-on training.

<u>Fall detection</u>

Fall detection worked, although it was difficult to evaluate false positives/negatives in a systematic way and the limitation of the navigation made this feature more complicated.

<u>Games</u>

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Games worked correctly. At the time of the Hands-on training, it was not decided which games to be included in this use case.

Temperature measurement

Temperature measurement worked correctly during the experimentation.

Alerts

The alert of high temperature, which worked by calling someone such as a relative or caregiver, worked correctly.

Reminders

CH personnel were still testing the functionality of reminders at the time of the Hand-on training. The way reminders were introduced was appropriate for the older adults' home scenario. However, for the residential care home, it was recommended an interface to be provided to allow staff to make use of it, otherwise, CH would have to intervene at this step.

Hands-on training with older adults' participants

Six older adults were recruited for the hands-on training sessions, 5 of them were users of Ca'n Granada (Figure 31) and 1 was living independently in a detached house (Figure 32). One manager of Ca'n Granada also attended the session.

Figure 31. UC-PT1-004 Hands-on training at Ca'n Granada

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Figure 32. UC-PT1-004 Hands-on training at the individual home

Regarding general impressions on the robot, Ca'n Granada management team suggested a change of scenario, due to the size of ARI. ARI was seen as too big to be co-living with older adults in their own rooms (initial idea). Instead, ARI was seen to suit better as a digital assistant which can be located at the common rooms on the ground floor. This consists of the entrance hall, where there is the reception desk and a waiting area, and a contiguous room (Figure 33).

Figure 33. UC-PT1-004 Common shared areas on ground floor in Ca'n Granada

<u>Functionality: agenda and reminders</u>

Caregivers saw this option as useful. They would use it for multiple purposes (activities, suggestions about medication intake, and suggestions about diet, appointments, and messages).

Older adults' participants living in an individual home liked the idea of checking the events for the present day and get a reminder about it. When they tried the process of reminders after logging in their session was followed without problems. It was foreseen that most reminders were told when the user logs in.

The option of looking for the person at the time of the reminder was considered interesting when ARI is co-living with the person. However, in the faced scenarios there were many chances that the older adult wouldn't be found by ARI due to space limitations and number of users.

<u>Functionality: pre-defined messages</u>

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This functionality was particularly liked by the person living in an individual home, for caregivers at the residential care home this was interesting but less useful as there is always a professional around. Caregivers would like to receive these messages as emails.

Functionality: entertainment games

Older adults' participants followed the whole process without any problem. All participants wanted to play the games while sitting. 40% were interested in using this functionality. Ca'n Granada wished to have the games open to everyone, not only participants of the pilot.

Functionality: temperature

Older adults' participants had issues following the process. Mainly, it was difficult for them to centre their face and needed guidance from the presenter. It was not obvious if they had to give a step backward/forward in order to be detected properly. It was more difficult for shorter people.

The residential care home wished temperature functionality to be available for everyone, not only participants of the pilot. They would probably instruct users to approach ARI at a certain frequency to have the temperature checked.

Functionality: menu, shopping list

These functionalities were not ready at the time of the Hands-on training. The residential care home expressed interest and said that those functionalities could be useful if integrated in their care process.

Functionality: video call

The process was followed without problems by older adults' participants. They liked this functionality, particularly to communicate with family. The option of looking for the older adult when someone else is calling was found interesting when ARI is co-living with the person. However, in the faced scenarios there were many chances that the older adult wouldn't be found by ARI due to space limitations and number of users.

Functionality: face recognition

Older adults' participants had issues following the process. Mainly, it was difficult for them to centre their face and needed guidance from the presenter. It was not obvious if they had to give a step backward/forward in order to be detected properly. It was more difficult for shorter people.

Functionality: calling ARI

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Older adults' participants liked the idea of calling ARI to come to them. Usually, they were sitting.

Functionality: remote control

Particularly saw as useful when ARI is co-living with the older adult.

Functionalities suggested by participants

Ca'n Granada suggested that ARI's users could access the internet through its screens.

Feedback collected from participants was carefully analyzed and discussed with technical partners involved in this use case. This report can be found in the Annex 55.

However, not long after the hands-on experiments, the robot ARI was taken to Ca'n Granada again to present another use case, "a social robot that assists in cognitive activities" and the reaction of participants was quite negative. Older adults started a discussion about the recent introduction of robots in some areas and they commented that they did not like the idea. The statements they said were:

- I don't like talking to robots;
- I want to come to the supervisor's sessions, not do them with a robot;
- Robots don't have feelings;
- Robots are replacing people's jobs;
- I don't like using new technologies;
- I like talking to people not machines;
- I already know the robot.

The session could not be performed because all older adults left. After this episode, the SHAPES Project Manager at CH had several meetings with managing team at Ca'n Granada and with the psychologist conducting cognitive sessions there, who, after trying to speak with residents, thought that it could be quite difficult to get enough committed residents to participate in the following phases of the pilot. For this reason, it was decided to start looking for another residential care home to perform the research activities.

The technical team continued developing and integrating the functionalities that were not complete yet in order to enter Phase 4, where a validation of the technical aspects is pursued.

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5.8 Phase 4: Small Scale Live Demonstration

Phase 4 Small Scale Live Demonstration aimed at validating the technological aspects of the robot ARI to proceed to Phase 5. This phase was performed internally at CH because to perform Phase 4 with older adults it was necessary to have the Ethics Protocol approved by the Balearic Islands Ethics Committee. At that time, the approval had been already granted, however, when Ca'n Granada communicated that there were not enough residents willing to participate in the study and commit to use ARI, amendments on the protocol to change the location of the pilot activities were presented.

The new residential care home chosen was La Porcíncula, also located in Palma de Mallorca. However, there was no time to conduct Phase 4 at La Porcíncula with older adults as the approval was still due. Instead, it was decided to conduct Phase 4 internally, as at the end Phase 4 aims to check all technical aspects before proceeding with the large-scale pilot activities where participants use the solutions in a real-life environment and data is collected. Therefore, Phase 4 was performed with workers from CH not previously involved in the SHAPES project.

However, before performing the official testing, SHAPES Project Manager at CH performed a technical test that lasted a few weeks to identify technical issues that would compromise the good course of the study. As a result, the following issues were detected and communicated to PAL:

- **Hardware issues:** Sometimes ARI blocks and interaction is impossible neither through voice or touchscreen;
- **Agenda:** The events added to the agenda were not always visible to users;
- **Entertainment game:** The puzzle didn't always respond properly when the user would touch the screen to move one piece;
- **Other adjustments:** Correction of grammar errors.

Internally detected errors were addressed and fixed and the proposed improvements were implemented before the recruitment of participants to develop the official Phase 4 of the use case. The only issue difficult to be addressed was the first one listed regarding the hardware, as after discussing it with PAL technical team, it was considered an isolated issue and the cause couldn't been found. However, the frequency of this issue is quite low and therefore doesn't interfere with the proper course of the project.

5.8.1 Recruitment of participants

Inclusion criteria

- Workers from CH;
- Having consent capacity;

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- Being of legal age.

Exclusion criteria

- Being involved in the SHAPES project or having previous detailed knowledge about the use cases;
- Not having consent capacity;
- Not being of legal age.

Sample size

Two participants were recruited to perform Phase 4.

Duration

Two sessions with each participant, a total of four sessions on two different days within one week.

Method

No financial incentives were provided for participating in Phase 4.

SHAPES Project Manager at CH screened potential eligible participants within CH workforce. The first communication about the pilot was directed from the project manager to the potential participants. Information sheets (paper-based) were provided to potentially eligible participants that showed interest. Potential participants were contacted after 24 hours to allow time to consider the information provided. Eligibility was confirmed by the principal investigator at pilot site and the project manager countersigned the informed consent, obtained in a handwritten format, and delivered a copy to participants as an acknowledgment of reception.

Informed consent procedure

Eligible individuals were provided with a participant information sheet explaining the background and purpose of the study and what they could expect to happen if they agree to participate.

Those who agreed to take part were given a consent form by personnel of CH. Signed consent forms and contact details were then handed over to CH personnel to proceed with the study activities.

Informed consent for all participants were taken with the following accepted forms of signatures:

- Typewritten
- Physical handwritten signature

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- An electronic representation of a handwritten signature

The informed consent signed by participants was signed by the SHAPES manager at CH to acknowledge reception and a physical or electronic copy of the document was provided to the participants by personnel of CH.

This includes acceptance of the following:

- Information sheet for participants (Annex 56);
- Consent form (Annex 57);
- Study protocol.

5.8.2 Technical aspects & Logistics

When developing Phase 4 the robot was placed in a quiet room at CH. The robot was set up and introduced to participants by the SHAPES Project Manager at CH. ARI stayed at this location for the whole length of Phase 4. The Project Manager monitored and responded to any doubt or technical issue that participants had, with the support of SHAPES technical partners.

At this time, SHAPES IDs were created for this use case, which allowed users to log in through their single SHAPES account. CH research team did the necessary tests to check that the data flow was correct and adjusted to the data plan, including the integration with ASAPA for user identification and data transfer to the Data Lake.

5.8.3 Roles and Responsibilities

SHAPES Project Manager at CH oversaw the setup of the robot and the training process. She carried on all tasks related to the ethic requirements. The technical team at CH developed the chatbot in Spanish using the Adilib platform, as well as the agenda, the predefined messages and the contact list for the video calls. This process that started early on and finished just before Phase 4 and was responsible for adjusting the screen structure based on feedback collected during previous phases, together with PAL technical team. Once participants started testing the digital solution within Phase 4, the Project Manager was their contact person for any technical issues, which were communicated to the technical team led by PAL, and they were responsible for taking the proper actions by accessing remotely to the robot when needed and solving doubts.

The research team at CH visited the residential care home La Porcíncula to study the physical space and the daily routine of residents to adapt the use case to this new setting.

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5.8.4 Ethical considerations

Approval from the local Ethics Committee was obtained from the Balearic Islands Ethics Committee. The approval was granted without the navigation mode and therefore without the fall detection function, as this makes sense when the robot moves around looking for people. The review board was not comfortable with the navigation of the robot around older adults without covering this risk, however, it was impossible to find an insurance company to cover the risk of a robot in a research study navigating autonomously, as this risk, at list in Spain, is not regulated yet. Then, it was decided to proceed without these features.

Along with the Ethics Protocol, Data Protection Impact Assessment (DPIA), Data Processing Agreement (DPA) and Data Sharing Agreement (DSA) were prepared.

Data Protection Impact Assessment was finished before the start of the recruitment of participants (including data risk assessment).

Data Processing Agreements were finished before the start of the recruitment of participants. The pilot site, in this case CH, is the data controller and has access to the entire dataset. In addition, data Processing Agreements were implemented to facilitate sharing pseudonymised data with specific SHAPES partners for particular purposes.

Ethical self-assessment was rechecked before sending the protocol to the local Ethics Committee.

A trustworthy Artificial Intelligence assessment list was also checked before the start of the recruitment process.

5.8.5 Outcome of the Small-Scale Live Demonstration

The small-scale live demonstration took place in January 2023. The evaluation of the outcomes is presented in Table 128.

Table 128: UC-PT1-004 Outcome of Phase 4

Outcome	Measurement	Instrument
ARI performance	Technical information about ARI performance during sessions.	Log files and remote monitoring of ARI sessions
Technical aspects	Analysis of the different functionalities of ARI.	Semi-structured

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		interview guide
Adverse events	Participants were asked about the occurrence of any adverse event or system errors.	Question at the end
Trust and technology acceptance	Scale Score	TAM
Self-perceived usability	Scale Score	SUS, UEQ-S
Participants' perception	The perception of the digital solution and its purpose of Support Older Adults to Live Independently and Remain Socially Connected. Analysis of functionalities offered and their integration into ARI.	Open interview

The Project Manager at CH presented ARI and all its functionalities to Phase 4 participants. After a group introduction, she scheduled the four sessions within one week, two sessions per participant. Participants were asked to test the following functionalities to provide feedback, paying particular attention to the technical performance of the digital solution; agenda, pre-defined messages, videocall, entertainment games, weekly menu selection and temperature measurement. They were also asked about the chatbot, responsiveness and speed of the robot and the screen structure.

Due to integration difficulties, face recognition was not used in this use case. At the beginning of Phase 4 this functionality stopped working in the robot ARI located at CH due to a bug. The configuration process was really time consuming, and it was decided to leave this functionality out and focus on improving the performance of the functionalities that specifically support older adults to live independently and remain socially connected. Moreover, at earlier stages of the use case, the possibility of using ARI in group sessions was contemplated; in this scenario it was very convenient to reorganise participants through face recognition. However, the robot ARI and the integrated functionalities were piloted at La Porcíncula in individual sessions, so the benefit of face recognition wasn't that high anymore. Even though this functionality would have added value for participants, after a cost-benefit analysis we decided to carry on without it.

For the internal technical report please see Annex 58.

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5.8.6 Results of the Small-Scale Live Demonstration

After the total four sessions, individual face-to-face interviews were conducted to collect feedback from participants. The results are shown in the Table 129 and Table 130.

Table 129: UC-PT1-004 10-Point Likert Scale to collect feedback about technical aspects

Participant	Responsiveness	Speed	Chatbot performance	Screen structure	Overall satisfaction	TOTAL
P1	6	6	7	9	7	7
P2	6	7	7	8	7	7
TOTAL	6	6.5	7	8.5	7	**7**

Table 130: UC-PT1-004 10-Point Likert Scale to collect feedback about functionalities

Participant	Agenda	Messages	Video call	Entertainment games	Weekly menu	Temperature	TOTAL
P1	9	7	8	9	8	9	8.33
P2	8	8	7	8	7	8	7.66
TOTAL	8.5	7.5	7.5	8.5	7.5	8.5	**8**

Figure 34 to Figure 38 show these functionalities.

Figure 34. UC-PT1-004 Agenda displayed by the robot ARI

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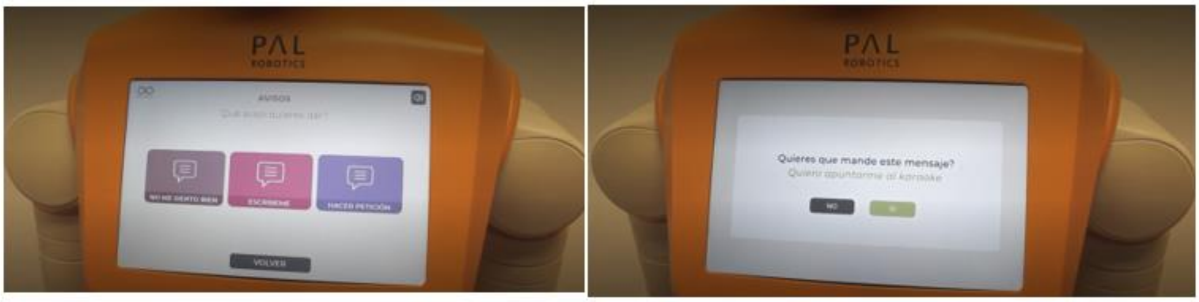

Figure 35. UC-PT1-004 Predefined messages displayed by ARI

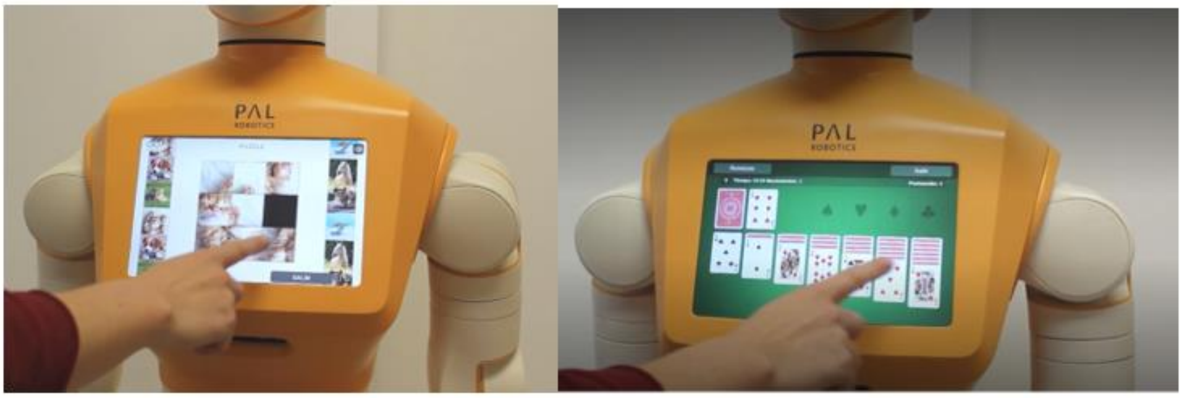

Figure 36. UC-PT1-004 Games displayed by ARI: Puzzle and Solitaire

Figure 37. UC-PT1-004 Weekly menu selection displayed by ARI

Figure 38. UC-PT1-004 Temperature measurement displayed by ARI

From the two previous tables it's possible to see that the overall satisfaction with the technology is quite positive, being 7 out of 10, but functionalities are better rated than

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technical performance, being 8 out of 10. This shows that proper integration of the different digital solutions and the overall performance of the robot (both software and hardware) are key factors for a good user experience.

Among the four sessions, the following errors were reported, being a total of five. The results are shown in the Table 131**Error! Reference source not found.**.

Table 131: UC-PT1-004 Errors reported by Phase 4 participants

Error	Type of error	Times reported (n)	Mitigation action & result
Error 1	During the interaction, at a certain point ARI stopped responding neither through voice nor through the touch screen. As a result, the screen froze, and interaction was not possible.	1	System restarted, after that the robot ran properly again. This was considered an isolated event.
Error 2	The robot didn't understand "mi agenda" (my agenda) when the user said so with the aim of view the events assigned for today.	1	"Mi agenda" was included in the chatbot as a "sentence example" to access the agenda, so ARI would recognize it and display the agenda.
Error 3	The agenda was displayed but ARI didn't always say load the events one by one. Sometimes ARI wouldn't say anything when showing the agenda, even if there were events.	3	This issue was discussed with PAL technical team and fixed. After that, CH did a set of tests to check that this issue was solved.

Table 132 shows the results of TAM and SUS questionnaires.

Table 132: UC-PT1-004 Trust, acceptance and self-perceived usability of Phase 4 participants

Participant	TAM (21)	SUS (100)
Participant 1	17	82.5
Participant 2	16	75
TOTAL (mean/sd)	16.5 (0.71)	78.75 (5.3)

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Table 133 shows the results of UEQ-S questionnaire.

Table 133: UC-PT1-004 UEQ-S for Phase 4 participants in relation to existing values from a benchmark data set

Scale	Mean	Comparison to benchmark	Interpretation
Pragmatic Quality	1,625	Good	10% of results better, 75% of results worse
Hedonic Quality	2,250	Excellent	In the range of the 10% best results
Overall	1,94	Excellent	In the range of the 10% best results

Table 134 gathers some quotations from Phase 4 participants.

Table 134: UC-PT1-004 Feedback from Phase 4 participants in an open interview

Participant	Quotation
Participant 1	"I really like the idea of the agenda; I think it is a good way for older adults to take control over their daily activities." "The overall performance is good, but the responsiveness could be better, ARI takes a little bit too long to answer."
Participant 2	"I like the functionalities, but user experience would improve if the videocall could be done through the robot ARI instead of through the tablet". "For me, the most interesting thing is the idea that older adults can send quick messages because some of them don't have a communication system to be in contact with their relatives or caregivers."

After Phase 4, CH research team analysed the data collected from participants and developed a technical report, which was sent to PAL technical team. Moreover, a technical meeting was held between CH and PAL to discuss the results of Phase 4 and take the proper action before Phase 5.

Regarding the overall performance of ARI in terms of speed and responsiveness, these issues are probably due to the number of integrations within the system. They are difficult to be improved within the scope of this research project. However, this aspect should be considered in the future to enhance user experience.

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5.9 Phase 5: Large-scale pilot activity

CH considered many retirement homes in Mallorca to develop Phase 5, but not all of them had the resources to take ARI and perform the piloting activities. Therefore, Phase 5 was performed at La Porcíncula, a residential care home only for Franciscan Fairs so all residents are men, being 18 residents in total. The residential care home counts with nursing service, and residents follow a semi-structured daily routine based on exercises, meal service, group activities, etc. La Porcíncula was a suitable place to perform the large-scale pilot activities, because there are two health workers (caregivers) per shift, which allow them to spend time on alternative activities outside the daily routine. Moreover, there are shared spaces to place ARI, which was a limitation for other residential care homes that were also considered for this study.

Hypothesis: Social robot ARI and the integrated functionalities Support Older Adults to Live Independently and Remain Socially Connected.

Primary objectives

- To investigate user engagement with the novel system (PO1);
- To investigate the user-perceived usefulness of the novel approach (PO2).

Secondary objectives

- To explore user trust and acceptance of the novel system (SO1);
- To analyse the novel system’s capability to Support Older Adults to Live Independently and Remain Socially Connected (SO2);
- To investigate the correlation between emotion recognition and user engagement (SO3);
- To analyse the novel system’s capability to improve older individuals' quality of life, well-being, and psychological and psychosocial aspects (SO4);
- To improve the emotion recognition algorithm (SO5);
- To improve human-robot interaction (SO6).

Tertiary objectives

The following objectives align with the general purposes of the SHAPES large-scale piloting campaign:

- To validate the capability of the SHAPES Platform and Digital Solutions to support and extend healthy and independent living for older adults who are facing permanently or temporarily reduced functionality and capabilities (TO1);
- To validate the capability of the SHAPES Platform and Digital Solutions to improve older adults’ health outcomes and quality of life (TO2);
- To validate the capability of the SHAPES Platform and Digital Solutions to gain the older adults’ trust and acceptance (TO3);

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To validate the capability of the SHAPES Platform and Digital Solutions to gain the care professionals' trust and acceptance (TO4).

5.9.1 Recruitment

The recruitment was performed within the residential care home La Porcíncula.

- Older adults:
  - Inclusion criteria:
    - Older adults 60 years old or above;
    - Living at residential care home La Porcíncula;
    - The time commitment to the training protocol;
    - Good hearing and sight;
    - No signs of any significant mobility difficulties;
    - Self-reported consent capacity.
  - Exclusion criteria:
    - Diagnosis of severe neurological or psychiatric disorders;
    - Drug abuse;
    - No consent capacity.
- Caregivers
  - Inclusion criteria:
    - Working at residential care home La Porcíncula;
    - The time commitment to the training protocol;
    - Self-reported consent capacity.
  - Exclusion criteria:
    - Under legal age.

Sample size

Five older adults were recruited among a pool of thirteen participants. Moreover, one formal caregiver was recruited, comprising six participants.

Duration

Phase 5 lasted four weeks and was conducted between the 8th of May and the 4th of June 2023.

Methods

The recruitment process started by contacting the care team at the residential care home La Porcíncula. CH research team communicated the eligibility criteria and went over the resident's profile to select potential participants. Information sheets (paper-based) were provided to potentially eligible participants that showed interest. Potential participants were contacted after 24 hours to allow time to consider the information provided. Eligibility was confirmed by the principal investigator at pilot site and the

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project manager countersigned the informed consent, obtained in a handwritten format, and delivered a copy to participants as an acknowledgment of reception.

No financial incentives were provided for participating in Phase 5.

Older adults screening procedure:

- **Screening:** the care team of La Porcíncula screened their user list for potentially eligible participants.
- **Invitation:** the first communication about the pilot was directly from the care team of La Porcíncula to the potential participants.
- **Information sheets:** information sheets (paper-based) were provided to potentially eligible participants that showed interest. 24 hours were provided to allow time to consider the information before consent was obtained Annex participant information sheet for older adults.
- **Eligibility confirmation:** eligibility was confirmed by the principal investigator at CH.
- **Consent form:** Those who agreed to take part were given a consent form by personnel of CH. Signed consent forms and contact details were then handed over to CH personnel to proceed with the study activities. (Annex 59)

Caregivers screening procedure:

- **Screening:** the head nurse at La Porcíncula screened their professionals' list for potentially eligible participants;
- **Invitation:** the first communication about the pilot was directly from the head nurse at La Porcíncula to the potential participants;
- **Information sheets:** information sheets (paper-based) were provided to a potentially eligible participant that showed interest. 24 hours were provided to allow time to consider the information before consent was obtained.
- **Eligibility confirmation:** eligibility was confirmed by the principal investigator at CH.
- **Consent form:** Those who agreed to take part were given a consent form by personnel of CH. Signed consent forms and contact details were then handed over to CH personnel to proceed with the study activities. (Annex 60)

The SHAPES Project Manager at CH obtained informed consent in a handwritten format. In addition to full name, explicit and optional acceptance of being recorded (video) and getting emotions analysed were collected in consent. The SHAPES Project Manager at CH countersigned the informed consent, and a copy was delivered to participants as an acknowledgment of reception.

Informed consent for all participants were taken with the following accepted forms of signatures:

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- Typewritten
- Physical handwritten signature
- An electronic representation of a handwritten signature

The informed consent signed by participants was signed by the SHAPES manager at CH to acknowledge reception and a physical or electronic copy of the document was provided to the participants by personnel of CH.

This includes acceptance of the following:

- Information sheet for participants;
- Consent form;
- Study protocol.

A user manual was developed and provided to Phase 5 participants to explain how to interact with ARI step by step. The user manual can be found in the Annex 61.

5.9.2 Roles and responsibilities

The CH research team was responsible for recruiting, including collecting consent from participants. Moreover, it was responsible for collecting questionnaires from participants at baseline and at the end of the phase to analyse the result of the piloting activities and train participants on how to use the robot ARI. The SHAPES Project Manager at CH was responsible for setting up the robot at La Porcíncula (transportation, Wi-Fi network connection, etc.) and was the contact person of the pilot site to communicate any issues or to solve questions. PAL technical team was responsible for addressing major technical issues that difficult the completion of the piloting activities. Finally, CH research team was responsible for analysing the data, getting conclusions and writing up the study results.

5.9.3 Ethical considerations

The study protocol was approved by the Ethics Committee of the Balearic Islands. In addition, an ethical self-assessment for Phases 1–5 of this use case was completed, including a Data Protection Impact Assessment (DPIA). This document forms the assessment of whether the processing of personal data is on the right level from a GDPR point of view, and it also describes the potential corrective actions to be taken if needed. By this DPIA the pilots could also assess that they implemented all ethical privacy and data protection requirements set in SHAPES D8.4. Moreover, individual Data Processing Agreements were signed with each of the technical partners before the start of the recruitment of participants.

Regarding the data processing inside the robot ARI, the main purpose is to know how often the robot is used anonymously, to make sure it is working properly and evaluate its general usage but will not be linked to the user in question. The complete

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anonymized dataset which is analysed later is sent to the Data Lake. For Phase 5, participants were provided an information sheet specifying the procedures involved and the nature of the research, including the processing of personal data as part of the research and on the SHAPES platform. Written consent from each participant was obtained before Phase 5.

In case of CH, a folder containing hard originals and copies of documents related to the use case, including consent forms and filled questionnaires, are retained in a locked office pedestal located CH (Palma de Mallorca, Balearic Islands). In addition, an electronic copy of the documents and the participants list (linking the participants' names to their pseudonymized SHAPES ID) are retained by approved CH staff working on the SHAPES study and stored securely on CH servers protected by the CH firewall. Only CH staff authorised to work on the SHAPES project had access to identifiable pseudonymized documents.

5.9.4 Communication and dissemination of pilot activities

Any data that arise from the pilot study will be owned by the sponsor, CH with the support of PAL Robotics as lead technical partner. On completion of the study, all data has been analysed and tabulated and used to prepare a final report, available as one of the agreed deliverables of the SHAPES Innovation Action — Deliverable D6.2. This deliverable (and all other agreed deliverables) will be available to the public for review and accessible via the SHAPES website (www.shapes2020.eu). Participants will be notified of the outcome of the study. CH will seek to disseminate the findings from this study at conferences and in the scientific literature. As per the SHAPES Publication Protocol, all publications arising from this study will reflect the range of effort that has made them possible; including conceptualisation of the research project and research task, methodology development, data collection and analysis, interpretation and discussion of results; as well as project management. Any publications will be read and meaningfully contributed to by all named authors. CH will also seek to communicate the findings of this study via social media, and in other, non-peer reviewed, media outlets. Participating SHAPES partners will have the rights to use data from this study in their own analysis and dissemination plans. As detailed under 'Access to Data', Data Sharing Agreements are in place to facilitate sharing pseudonymised data with specific SHAPES partners for specific purposes.

5.9.5 Risk management

All foreseeable data-related risks have been compiled into detailed risk assessment documents, part of the Data Protection Impact Assessments for Phase 5 PT1-004. First, a risk classification, root cause, name, and consequences were assigned for each risk identified. Once identified, each risk was then analysed and attributed a score from 1 (unlikely/minor) to 4 (almost specific/critical) for probability and impact. Subsequently, appropriate mitigation actions were assigned and a reasonable person responsible was identified. These risks were reviewed periodically, and these documents have been updated along all the study's phases to include all new identified risks.

In addition to data risks, a potential threat to participants due to the unlikely occurrence of a device malfunction was also identified and mitigation actions were put in place. However, there has been no need to implement those actions as no undesirable events compromising participants' integrity have occurred during the piloting activities.

5.9.6 Outcome of large-scale pilot activity

Several instruments were used at Phase 5. At the baseline the instruments used were: Sociodemographic questions, World Health Organization Quality of Life – BREF (WHOQOL-BREF) [10], the EuroQol 5 Dimensions 5 Levels (EQ-5D-5L) [11], the General Self-Efficacy (GSE) [12], the Oslo Social Support Scale (OSSS-3) [13], the Single-item Health Literacy Measure, the Loneliness Scale (UCLA V3) [16], Gijón's social-familial scale [18] and the Scale of Positive and Negative Experience (SPANE) [19].

At the end of the pilot all these questionnaires were repeated to evaluate the impact created by using the technology. Moreover, some other instruments were used to evaluate the overall experience of users; the System Usability Scale (SUS) [14], the Technology Acceptance Model (TAM) [15], the User Experience Questionnaire – Short Version (UEQ-S) [20], the SHAPES participation questions and some general questions on the perceived impact. This data was collected within the 14 days after the end of the pilot in face-to-face, one-to-one interviews and through forms to fill individually with the presence of a researcher for resolving doubts.

In addition, several adherence rates (inclusion rate, refusal rate, exclusion rate, dropout rate and retention rate) were also calculated. Table 135 presents the instruments used and respective outcome.

The case report forms provided to participants at Baseline and End of the Pilot have been included in Annex 62 and Annex 63.

Table 135. UC-PT1-004 Outcomes of Phase 5

Instrument	Outcome
Start/end timestamp of interaction (session) and functionalities	Information on the number of accesses, sessions duration and type of functionalities used.
Team registrations	Adherence Rates: • **Inclusion rate:** The ratio between the number of participants included in the study and the total number of people contacted;

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	• **Refusal rate:** The ratio between the number of subjects who refused to participate in the study and the number of subjects contacted; • **Exclusion rate:** The ratio between the number of individuals excluded for not meeting the inclusion criteria and the total number of individuals contacted; • **Dropout rate:** The ratio between the number of participants who dropped out of the study and the number of participants who completed the baseline assessment; • **Retention rate:** The ratio between the number of participants who completed the final assessment and the number of participants who completed the initial assessment.
Weekly phone call to caregiver	**Adverse events:** Participants were asked about the occurrence of any adverse event that they related to the intervention. If they answered yes, they were asked to clarify what had occurred; **Feedback provided by the participants:** Issues and errors reported.
Semi-structured interview guide (both older adults and caregivers)	**Perception of participants (usability and acceptability) towards the intervention:** The interview guide included questions about the structure of the program, resources used and the overall experience interacting with the robot.
Sociodemographic questions	Sociodemographic data: Number of years of formal education; date of birth; gender (male/female/other); marital status (married/cohabiting/single-never married/separated/divorced/widowed); occupational status (full time employment/part time employment/unemployed/retired); caregiver status (full time/part time/no); help family (never/rarely/sometimes/ often); professional help (never/rarely/sometimes/often), neighbourhood environment (urban/rural); residence type (own home/caregiver's home/long-term care facility/other); co-living with someone (yes/no); country.
WHOQOL-Bref	Quality of life
EQ-5D-5L visual analog scale (EQ-5D & VAS)	Health-related quality of life

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GSES	Self-efficacy
OSSS-3	Social Function
1-item health literacy	Health literacy
UCLA V3	Perception of loneliness
Gijón scale	Social-familial data
SPANE	Positive and negative experiences
SUS (both older adults and caregiver)	Self-perceived usability
TAM	Technology acceptance
UEQ-S	User Experience
SHAPES Participation questions	Participation

Regarding data collection and storage, automatic data collected by the robot is stored in an internal hard disk in as rosbag data, a file format in ROS (Robotics Operating System) for storing ROS message data such as camera streams and robot logs. Data for authentication has been stored in the SHAPES platform (ASAPA). Data collection for the interview participants and filling forms were documented on a case report form (CRF). In addition, paper questionnaires form part of the CRF, and the CRF was the source for questionnaires. All data has been transcribed onto an electronic database using Excel or LibreOffice Calc and analysed using Excel or LibreOffice Calc.

5.9.7 Results of the Large-Scale Pilot Activity

Adherence rates of Phase 5 are presented in Table 136.

Table 136: UC-PT1-004 Adherence rates for Phase 5

Adherence rate	Calculation method	Result
Inclusion rate	The ratio between the number of participants included in the study (6) and the total number of people contacted (13).	46.15%

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Refusal rate	The ratio between the number of subjects who refused to participate in the study (4) and the number of subjects contacted (13).	30.77%
Exclusion rate	The ratio between the number of individuals excluded for not meeting the inclusion criteria (3) and the total number of individuals contacted (13).	23.08%
Dropout rate	The ratio between the number of participants who dropped out of the study (0) and the number of participants who completed the baseline assessment (6).	0%
Retention rate	The ratio between the number of participants who completed the final assessment (6) and the number of participants who completed the initial assessment (6).	100%

In CH, five older adults participated the study, with a mean (±sd) age of 85.4 ±5.41 years old, of whom 100% were males and 0% were females. In this case, we could not comply with gender equality in the CH study because the chosen residential care home is only for men.

Table 137 presents the demographics data for older adults participating in Phase 5 of UC-PT1-004.

Table 137: UC-PT1-004 Demographics data for older adults' participants in Phase 5

Demographics	CH (*N*=5)
Age (years) mean(sd)	85.4 (±5.41)
Gender	0% Female 100% Male
Health Literacy (How confident are you in filling out medical forms yourself?)	Extremely 25% (*N*=1) Quite a bit 25% (*N*=1) Somewhat 25% (*N*=1) A little bit 25% *(N*=1) Not confident 25% (N=1)

The piloting activities were developed in a real-world environment. ARI was placed in a common room at La Porcíncula residential care home and participants could use

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ARI freely. The caregiver would encourage participants to use ARI but, in the end, they would decide to use or not use the digital solution.

The intervention included the following options (a) agenda, (b) pre-defined messages, (c) videocall and (d) entertainment games. Moreover, participants could also check their temperature thanks to an integrated thermal camera. The option of choosing the weekly menu was deleted as in La Porcíncula users doesn't have the option of choosing the menu; an external catering provides them the meals on the daily basis.

The robot was left at the residential care home over a period of four weeks and participants were asked to interact with the robot freely with the guidance of the formal caregiver participating in the study. At the end of the pilot, participants reported their levels of enjoyment of the activities using a 0-10-Point Likert scale (higher scores imply higher enjoyment). Moreover, one-to-one interviews with participants were conducted at the end of Phase 5 to explore their overall experiences and collect feedback.

After the piloting activities, participants reported enjoyment with an average of 7.4 (out of 10) (*SD* = 0.89) representing a positive interest for the robot ARI and the optioned offered.

Regarding usability, the TAM questions yielded an average score of 14.4 ±3.13 out of a maximum of 21, while the SUS had a score of 58.5 ±11.12 out of a maximum of 100. These results indicate a good level of acceptance but a low self-reported usability if we compare it with benchmark results. Analysing the results of the SUS we see that 3 out of 5 participants thought that the DS, the robot ARI was "cumbersome (awkward) to use". This might be due to the low level of familiarisation of participants with humanoid robots, as for all of them it was the first time to interact with this kind of technology. The results are shown in Table 138 and Table 139.

Table 138: UC-PT1-004 Trust, acceptance and self-perceived usability of Phase 5 participants (older adults)

Participant	TAM (21)	SUS (100)
P1	11	50
P2	13	60
P3	16	65
P4	13	45
P5	19	72.5
TOTAL (mean / sd)	14.4 (3.13)	58.5 (11.12)

Table 139: UC-PT1-004 UEQ-S for Phase 5 participants (older adults) in relation to existing values from a benchmark data set

Scale	Mean	Comparison to benchmark	Interpretation
Pragmatic Quality	1.25	Above average	25% of results better, 50% of results worse
Hedonic Quality	1.7	Excellent	In the range of the 10% best results
Overall	1.48	Good	10% of results better, 75% of results worse

As shown in Figure 39, the overall participants' experience interacting with the robot ARI has been "Good" compared to the existing values from benchmark data. Therefore, even if participants rate the DS below average in terms of usability (SUS), the user experience is rated as "Good" (UEQ-S). Hedonic quality is rated as excellent, and pragmatic quality is rated above average.

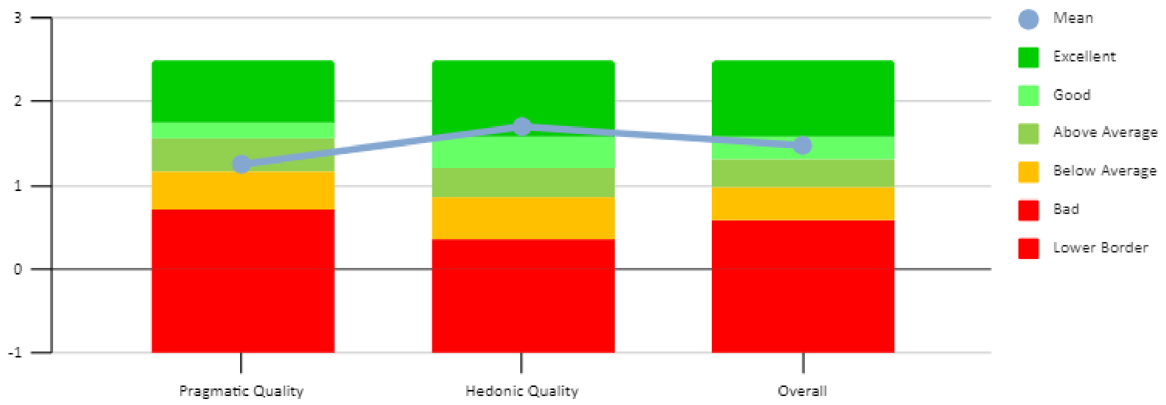

Figure 39. UC-PT1-004 SUS results for Phase 5 (older adults)

Every participant (older adult) answered The Scale of Positive and Negative Experience (SPANE) at the baseline and at the end of the pilot. SPANE is a brief 12-item scale asking respondents to rate how often they experience various states. The scale can serve as useful feedback for users who undergo an intervention to increase their positive feelings. The results are shown in Table 140.

Table 140: UC-PT1-004 SPANE results for the participants. Comparison between baseline (BL) and end of pilot (EP)

	P1		P2		P3		P4		P5		TOTAL		Diff.
SPANE (1 to 5)	**BL**	**EP**	**BL**	**EP**	**BL**	**EP**	**BL**	**EP**	**BL**	**EP**	**BL mean(sd)**	**EP mean(sd)**	
Positive	4	5	4	4	5	5	4	4	4	4	4.2 (0.45)	4.4 (0.55)	**4.55%**

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Negative	1	1	2	2	1	1	3	3	2	2	1.8 (0.84)	1.8 (0.84)	0%
Good	4	4	5	5	4	4	4	4	4	4	4.2 (0.45)	4.2 (0.45)	0%
Bad	1	1	1	1	1	1	1	1	2	2	1.2 (0.45)	1.2 (0.45)	0%
Pleasant	4	4	5	5	5	5	4	4	4	5	4.4 (0.55)	4.6 (0.55)	**4.35%**
Unpleasant	1	1	1	1	1	1	1	1	1	1	1 (0)	1 (0)	0%
Happy	4	4	3	4	5	5	5	5	3	3	4 (1)	4.2 (0.84)	**4.76%**
Sad	1	1	1	1	1	1	1	1	2	2	1.2 (0.45)	1.2 (0.45)	0%
Afraid	1	1	1	1	2	2	4	4	3	3	2.2 (1.3)	2.2 (1.3)	0%
Joyful	4	5	3	4	5	5	5	5	4	4	4.2 (0.84)	4.6 (0.55)	**8.7%**
Angry	1	1	1	1	2	1	1	1	2	2	1.4 (0.55)	1.2 (0.45)	**-16.67%**
Content	5	5	4	4	5	5	4	4	5	5	4.6 (0.55)	4.6 (0.55)	0%

Comparing the results of the SPANE at the baseline and at the end of the pilot we appreciate a slight increase of the following feelings: “positive”, “pleasant”, happy” and “joyful”. Moreover, the results reflect a decrease of the feeling “angry”. Even if the differences are not very significant, it seems that the use of ARI improves some of the positive feelings and decreases some of the negative feelings.

Detailed data on the quality of life and social support at baseline and end of pilot is presented in Table 141.

Table 141: UC-PT1-004 Characteristics of the older adults' participants that completed phase 5 at CH (results presented as mean (sd))

Quality of life and social support questionnaires (*N*=5)			
	Baseline	**End of pilot**	**3 months**
Quality of life and social support			
WHOQOL-Bref (0-100) [1]	72.02 (8.34)	73.10 (8.38)	NA

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Health related quality of life - EQ-5D-5L (5-25) [2]	7.8 (1.92)	7.8 (1.92)	NA
Self-efficacy GSE [3] (10-40)	26.4 (7.27)	26.8 (7.22)	NA
Social Function OSSS-3 [4] (3-14)	13.6 (1.34)	13.6 (1.34)	NA
Gijón's social-familial scale [9] (5-25)	13.6 (2.3)	13.6 (2.3)	NA
Loneliness (UCLA V3) [7] (20-80)	25.2 (6.87)	24.8 (7.19)	NA

The individual data for the older adults that used the robot ARI is presented in Table 142. Considering the UCLA V3 test, the total score slightly decreased from the baseline to the end of the pilot. This means that the overall sense of loneliness decreased after the use of the robot ARI. However, the decrease in not much significant which could be because it is not related or because participants would need a longer adaptation period, as declared by many of them.

Table 142: UC-PT1-004 Quality of life and social data for participants (older adults) in Phase 5

	WHOQOL-Bref (0-100)		EQ - 5D – 5L (5-25)		Self-efficacy GSE (10-40)		Social Function OSSS-3 (3-14)		Gijón's social-familial scale (5-25)		Loneliness (UCLA-V3) (20-80)	
	BL	EP	BL	EP	BL	EP	BL	EP	BL	EP	BL	EP
P1	72.02	72.74	7	7	37	37	13	13	17	17	25	25
P2	63.84	65.39	9	9	19	19	13	13	14	14	17	16
P3	66.9	68.45	10	10	21	22	13	13	14	14	25	24
P4	85.63	87.17	5	5	30	31	13	13	11	11	36	36
P5	71.73	71.73	8	8	25	25	16	16	12	12	23	23
Total	**72.02**	**73.1**	**7.8**	**7.8**	**26.4**	**26.8**	**13.6**	**13.6**	**13.6**	**13.6**	**25.2**	**24.8**

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*Baseline - BL | End of pilot evaluation (post intervention) - EP

Table 143 shows the answers to the SHAPES Participation questions.

Table 143: UC-PT1-004 SHAPES Participation questions' results of participants (older adults) in Phase 5

Participants	I participate enough in activities that are important to me	Using the robot ARI makes participating in the activities that are important to me
P1	Strongly Agree	A little easier
P2	Agree	A little easier
P3	Strongly Agree	A little easier
P4	Neither Agree nor Disagree	About the same
P5	Strongly Agree	A little easier
RESULTS	**60% Strongly Agree** **20% Agree** **20% Neither Agree nor Disagree**	**80% A little easier** **20% About the same**

80% of participants think that using the robot ARI makes a little easier participating in activities that are important to them.

Table 144 shows the perceived impact of participants using the DS.

Table 144: UC-PT1-004 Overall perceived impact of participants (older adults) in Phase 5

How has the use of the DS impacted your everyday life?							
	Health-literacy	**Self-management of health condition**	**Support for active and healthy ageing**	**Improving quality of life**	**Supporting extended living at home**	**No impact**	**Other**
P1			x				
P2			x				
P3			x				
P4			x				x

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P5			x	x			
TOTAL	**0%**	**0%**	**100%**	**20%**	**0%**	**0%**	**20%**

Even if the results of the SUS were lower than benchmark results, we can see that all participants reported a perceived impact of the DS as a support for an active and healthy aging and one of them thinks that it helps to improve his quality of life.

Table 145 and Table 146 show the willingness to pay of participants to use the DS and their opinions about who should pay for it.

Table 145: UC-PT1-004 Willingness to pay of participants (older adults) in Phase 5

Health cost data							
If this innovation was available to use in the future, how much would you be willing to pay for it per month?							
	< 5€	**5-10€**	**11-20€**	**21-50€**	**51-100€**	**> 100€**	**Not willing to pay**
P1							x
P2							x
P3							x
P4	x						
P5							x
TOTAL	**20%**	**0%**	**0%**	**0%**	**0%**	**0%**	**80%**

Table 146: UC-PT1-004 Opinions of Phase 5 participants about financing options

Who should pay for the DS?					
	Individual end-user	**Health insurance (private)**	**Health insurance (public)**	**Governme nt-funded**	**Other:**
P1				x	
P2				x	
P3				x	
P4				x	

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P5		x			
TOTAL	**0%**	**20%**	**0%**	**80%**	**0%**

Just one of the participants would be willing to pay for the digital solution. This might be since the most participants believe that this technology should be funded by the government.

A summary of participants' experiences and the overall feedback gained at the end of Phase 5, resulting from the final interviews is presented in Table 147 (older adults/caregiver). Experiences and information discussed among participants are categorized in five discrete axes: (i) Technology adoption and barriers, (ii) User experience and ease of use, (iii) Communication and social connections, (iv) Health and well-being and (v) Recommendations for improvement.

Table 147: UC-PT1-004 Results from final interviews to phase 5 participants (older adults/caregiver)

Thematic	Quotations
Technology Adoption and Barriers	Older adult: "The robot is too innovative, and I would need more time to adapt to it". Older adult: "There should be the option of sitting down to interact with the robot." Caregiver: "I have noticed that the robot ARI generated uncertainty and fear to older adults when they had to interact with it on their own." Caregiver: "Not every health worker is willing to devote time to new technologies and sometimes the workload makes it difficult. I think a change in the mentality of health professionals and caregivers is also necessary for these kinds of projects to succeed, as well as integrate it in the routine of each residence, hospital or home so it doesn't bring extra work."
User Experience and Ease of Use	Older adult: "What I liked the most was the interaction with a robot, the fact that it was listening to me and responding to my questions." Older adult: "I like being able to see the event I have today and send messages to the caregiver."

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	Older adults: "I have used the temperature measurement quite a lot, I found it interesting, but I would have preferred to know the exact temperature." Older adult: "I liked the games, especially the solitaire, it reminded me of when I played with physical cards." Caregiver: "Regarding the functionalities, I loved the agenda, I think it is important that older adults have the option of viewing their appointments by themselves, it empowers them and gives them confidence and the opportunity of not depending on others."
Communication and Social Connections	Caregiver: "The pre-defined messages were used very little because at La Porcíncula there is always someone on duty and therefore this functionality doesn't make much sense. However, I liked it and I think it would be very useful in a situation where the caregiver is not always present, for instance in a private home." Caregiver: "We haven't used the videocall option as some of them already have a smartphone to make videocalls and others prefer to simply make regular calls."
Health and Well-being	Older adult: "I like interacting with ARI because I think it is a good way of doing other type of activities and keep active and updated with new technological developments." Older adults: "I think robots like ARI can support an active aging, however, it is difficult for me to adapt to new technologies, I am not used to." Caregiver: "I think interacting with ARI is very beneficial for the residents because they keep physically and mentally active. I think they like it but need some encouragement, someone to support them."

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Recommendations for Improvement	Older adults/Caregiver: "Having the option of sitting while interacting with ARI or that ARI could get down at the level of the user." Older adults: "If I would have to use it in the future I would need more adaptation to it, along with some support." Caregiver: "Improve the responsiveness of the chatbot and overall robot as older adults doesn't have much patience and get frustrated quite easily."

Table 148 shows the score provided by the caregiver for the different functionalities using a 10-Point Likert Scale, along with comments.

Table 148: UC-PT1-004 Functionalities scoring by caregiver

Functionality	Score (1 to 10)	Comments
Agenda	8	"Now we, the caregivers, have their agenda information on the tablet and verbally communicates it to residents but they have to rely on us. The agenda helps them being more autonomous."
Messages	7	"I liked it but in La Porcíncula doesn't make much sense since there is always someone around. However, it works very well."
Videocall	6	"It works well but I rated it low because we didn't use it much as most residents prefer to make regular calls or even don't have anyone to videocall. None of them had children and usually their closest relatives and friends are about their age."
Entertainment games	9	"It is really nice option to have digitalized games, they liked this option, both puzzles and solitaire".
Temperature	9	"They have used this option quite a lot, it provides value for them and for us and helps them to take control over their health."
TOTAL (mean)	**7.8**	I liked the experience of using ARI with the residents and I think having they would eventually get used to it in the long term. They need more stimulating activities like this one.

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The formal caregiver participating in the piloting activities rated the DS with a SUS score of 90, which shows a high perceived usability. The notes taken during the interview to the caregiver at the end of the pilot can be found in the Annex 64.

KPIs compliance

The KPIs determined for this use case intend to measure performance in critical areas towards realising its objectives that were established during the planning of the Pilot in Phase 1. Table 149 lists the KPIs planned and critically analyses its fulfilment.

In this pilot, six out of seven KPIs were achieved, which is considered a very successful result. However, the frequency of interaction of older adults with ARI (50% of the older adults interact with the robot 50% of the days) was not achieved. The reason might be the lack of engagement of older adults to interact with the robot on their own. Most of them declared that the robot ARI was very interesting but too innovative for them and that they would need a long time to adapt to it. The caregiver participating in the pilot declared that when she was not on duty, older adults wouldn't interact much with ARI.

Table 149: UC-PT1-004 KPIs planned vs. achieved in PT1-004

	Planned	Achieved /Not achieved
Recruitment and retention	At least 80% of the target cohort were successfully recruited into the pilot during the recruitment period.	Achieved: It was planned to recruit at least 5 participants and 6 participants were recruited.
	At least 75% of recruited participants within the target cohort remained enrolled in the pilot until the end of the study.	Achieved: 100% of recruited participants remained enrolled in the pilot until the end of the study.
Technical performance	There is no re-start of any of the technology components for at least 90% of the days.	Achieved: Just one re-start of the robot was needed within the 28 days pilot period, so there was no re-start for 96.4% of the days.

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	Less than 2 technical incidents reported per week.	Achieved: Just one incident reported in 28 days.
User engagement and acceptance	The overall user experience quality of the robot as measured using (UEQ-S) was classified as ‘Excellent’, ‘Good’ or ‘Above average’ based on published benchmark data.	Achieved: The overall user experience quality of the robot as measured using (UEQ-S) was classified as ‘Good’.
	At least 50% of the older adults interact with the robot 50% of the days.	Not achieved: Older adults liked the robot ARI and the options offered but they had to be encouraged by the formal caregiver to use it. They would just interact with ARI when the formal caregiver participating in the project was on duty.
	At least one caregiver scored the DS above-average rating (>68) in the SUS.	Achieved: The formal caregiver participating in the pilot scored 90 in the SUS.

Deviations from the initial plan

- The face recognition software by VICOMTECH hasn’t been used in Phase 5 for users’ identification. This functionality was tested during Phase 3 and the performance was pretty good. However, just before Phase 4 and due to a bug, the software stopped working on the robot. Due to the time constraint and since face recognition was not considered key to the project success, it was decided to proceed without this functionality.
- Some functionalities such us navigation, fall detection or weekly menu couldn’t be implemented for diverse reasons already discussed.
- Emotion recognition data will be analysed in coming deliverables due to difficulties on interpreting the data set as it was stored. Technical partners are currently modelling the dataset to obtain meaningful results.

Final recommendations for tech-partners during and after the pilot

Hereafter we list general recommendations for technical partners to be considered after the SHAPES Project.

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- Adapt solutions to end user's needs. Many participants have complained about the fact that interaction with the robot ARI must be in a standing up position, which might be difficult for many older adults.
- Include end users in the design process, focussing on solving their needs.
- Improve the responsiveness of the solutions as older adults are not usually used to interact with new technological developments and get frustrated very easily.
- Develop clear and understandable user manuals aiming a smooth adaptation of end user to the technological development.

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6 Conclusion

In pilot 1 Smart Living Environment for Healthy Ageing at Home, 4 use cases were used to demonstrate the possibilities and capabilities of the SHAPES platform to create a friendly environment for older people that contributes to a more independent, better and healthier life at home and integrates them into an active and social life.

UC-PT1-001: Remote In Home Wellbeing Monitoring and Assessment

UC-PT1-002: Digital Assistant to Support Older People to Live Independently and Remain Socially Connected

UC-PT1-003: Overcoming the fear of digital technologies – competent usage of technologies – problem solving in the community

UC-PT1-004: Robot to Support Older People to Live Independently and Remain Socially Connected

Overall, 3 out of 4 use cases were successful based on the previously created KPIs.

UC-PT1-001 was successfully implemented despite its complexity and the resulting technical challenge. Technologically, there is still some room for improvement, but the possibilities of different wellbeing and smart home solutions could be shown.

UC-PT1-002, on the other hand, could not be successfully implemented. The reason for this is the lack of technological implementation. The lack of user-friendliness on both the caregiver and care receiver side led to the rejection of the digital solution by the participants. It is important to ensure that state of the art technology is used in the future.

UC-PT1-003 was very successful, both for the UC leader and the replicating site. The digital solution developed and applied was technologically mature, user-friendly and intuitive to use, except for a few minor details. The feedback from the participants was consistently positive across all areas.

UC-PT1-004, which was carried out exclusively by Clinica Humana, was also positive. Here, different examples were used to show how a robot can support the lives of older people.

Across all UC of pilot 1, a number of "lessons learned" were gathered, which will now be summarised for future projects:

<u>General recommendations for technical partners:</u>

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- The same basic layout and design should always be used across all applications.
- All applications should be found under the same interface and access; no different links to different applications
- Single App integration
- Prioritize User-Friendliness for Older Adults, the handling should be intuitive as possible, clear and simple labelling of diagrams, font size, contrast
- One-time registration with an ID or an account, allowing access to all individual applications without having to register again.
- Integration of comparative values / benchmarks
- Possibility to set own goals
- Basic differentiation of applications into wellbeing / smart home solutions and medical products; the barriers and requirements for use and testing are very different in these areas.
- Use of applications that are state of the art; many applications already exist in a highly developed state on the market.
- All application should be available in the user's native language
- Improve Natural Language Processing (NLP) Capabilities
- Ensure interoperability among all provided Apps
- Create a prototype that is as advanced as possible with regard to the idea of the final product
- Iterative Testing

General Recommendations for working with senior citizens in digitisation projects – lessons learned

In order to work successfully with senior citizens in digitisation projects, the following points are particularly important according to the experiences from this use case:

- Media that target seniors are suitable for addressing and recruiting seniors.
- According to our experience, senior citizens are mostly very interested in digitalisation. The chances of successfully recruiting seniors in digitisation projects increase if general knowledge about digitisation, depending on their level of knowledge, is provided in addition to project participation.
- In most cases, seniors can be divided into 3 digitisation groups: those who have a high technical and digital affinity and are already very knowledgeable, those who already have contact with digitisation from time to time but are not professionals, and those who are interested and want to become digitised but have no experience in the field of digitisation.
- The approach to these different groups should also be just as different.
- A test group should include all 3 types in order to get feedback from all 3 user groups.

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- Mock-up appointments and hand-on appointments should, in our experience, always take place within the three digitisation groups, so that no one is over- or under-challenged and everybody feel free to give comments
- The support within a life test phase should also be adapted to the user's level of digitisation.
- The less digitisation knowledge the participants have, the more time-consuming the support and communication with the participants.
- All digital applications or solutions to be tested should be tested in advance, for example by project managers, so that any errors, malfunctions or other difficulties can be discovered and resolved in advance. This also increases the trust of the seniors.
- It should always be ensured that a feel-good atmosphere prevails during joint appointments with the seniors, so that the seniors have confidence in the project, the applications and the project managers.
- In our experience, it was an advantage that the CCS participants were already involved from phase 2, so they felt well integrated throughout the development process and were able to understand the individual development steps, they were familiar with the actors and digital solutions.
- Involvement over such a long period of time (3 years) naturally requires a certain amount of communication between the individual phases or project deadlines. It is important to briefly inform the seniors in between. This should also be understood as a confidence-building measure.

General Recommendations for future pilot projects – lessons learned

Based on the experience of the pilot work in this project, we would also like to share some lessons-learned in this regard:

- UC001 involved 6 different technical partners from 5 different countries, each technical partner contributing a digital solution or part of a digital solution, the UC lead was again from a different country, replicating sites again in other countries which causes a high and time-consuming coordination and communication effort.
- integration of too many individual digital solutions from too many different actors is very difficult and very complex
- it could be more expedient to limit the amount of partners which could simplify the implementation, development and communication, and the process steps are accelerated considerably
- test only individual digital solutions in the first step before testing a complex interaction
- The applications to be tested or a product idea should be compared in advance with products or alternatives already available on the market.
- What should be the USP of the new product or solution to be developed; without a unique selling point it will have no future viability and will not achieve marketability.

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- Carry out a market analysis in advance.
- A scaling-up, i.e. a Europe-wide expansion of a pilot, i.e. a replication, should only take place after sufficient tests and perfect regional functioning.
- In the case of a Europe-wide upscaling, the issue of the language barrier or NLP must be clarified and it's financing and feasibility must be ensured.

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7 Ethical requirements check

Ethical issue (corresponding number of D8.4 subsection in parenthesis)	How we have taken this into account in this deliverable (if relevant)
Fundamental Rights (3.1)	CCS and all replicating partners of PT1 are committed to and have applied non-discriminatory selection criteria as well as language. CCS and all contributing partners recognize the crucial importance of defending the dignity, integrity and privacy of participating individuals. This pilot intends to further promote the fundamental rights of older adults as well as their informal and formal carers
Biomedical Ethics and Ethics of Care (3.2)	By respecting those involved in user interface design and usability assessments and performing a risk assessment and considering exclusion criteria that dismiss participants to whom the intervention may represent a risk of hurt or discomfort. Ethical committees were consulted, and green light was sought prior to Phases 5 of the use cases. Due to the fact that UC-PT1-001+UC002+UC003 was a product test in which 1.) no medical devices are used and no devices are used/developed that have a medical purpose 2.) no physicians are involved in the research project 3.) no scientists are involved in the research project, only the project managers of CCS GmbH. an official ethics approval was not necessary. An assessment was made by the data protection officer of CCS.

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	For UC-PT1-004 Ethical committees were consulted, and green light was sought prior to Phases 5 of the use cases. The use of webcams was explicitly mentioned, the functions of the robot and/or the voice-assistance Nari were detailed in the consent forms submitted to the individuals. The robot was placed in a nursing home offering a dedicated spot where non-consenting individuals would not be confronted to the robot. Feedback from participating individuals was included in this deliverable
Convention on the Rights of Persons with Disabilities and supported decision-making (3.3)	The will and preferences of older people and persons with disabilities were respected and prioritized at all stages. They were involved in the different phases of the use cases, their feedback was taken into account. Anonymity and confidentiality of data has been guaranteed at all stages. Ethical self-assessments were conducted to discover and minimize potential risks by developing according mitigation actions.
Capabilities approach (3.4)	By considering the users capabilities when planning the tests with users (such as physical or cognitive function).
Sustainable Development and CSR (4.1)	By planning a methodology that respects and protects human rights.
Customer logic approach (4.2)	By user addressing interface design and usability assessment that are user centred, i.e., that involve the user from the very beginning of the process.
Artificial intelligence (4.3)	Not applicable.
Digital transformation (4.4)	By improving the overall quality of the development and assessment process of the SHAPES platform and digital solutions.

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Privacy and data protection (5)	By detailing the measures planned to ensure users privacy and data protection and by complying with GDPR, requesting data protection officer's insights and approval from the ethics commission.
Cyber security and resilience (6)	Using secure communication protocols, have the database in a server protected firewall.
Digital inclusion (7.1)	By planning the inclusion of user with low levels of digital literacy.
The moral division of labour (7.2)	Not applicable.
Caregivers and welfare technology (7.3)	By considering the caregivers in cases that users are unable to use a computer due to digital literacy issues and supporting them on that task.
Movement of caregivers across Europe (7.4)	Not applicable.

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Appendices

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Annex 1

UC-PT1-001 contribution of TREE

Introduction

To assist older people living independently, TREE developed a solution that relies on smart sensors. These devices can monitor light, pressure, presence, electric, etc. This information was used to evaluate the routine of the people living in the house and stablish if something anomalous has occurred as it could indicate some kind of problem. To achieve this goal, we used data mining techniques and unsupervised learning, specifically, we used Self organizing Maps (SOM).

The data recollected in this pilot was not enough to apply the anomaly detection solution as most smart plugs were working faulty and data was collected only for one or two weeks. However, we found an open dataset described in [1] that can be used to showcase how the anomaly detection solution would work with different kind of sensors and sufficient data points.

One of the main discussions using SOM is the definition of a threshold that determines if a test data should be considered as anomaly or not. For this we tried using only SOM and tried tunning its hyperparameters to stablish a proper model. This proposal did not provide remarkable results as it the threshold could be considered too big. To fix this, we found in the literature the work [2] that implements a hybrid SOM and KNN algorithm. More specifically, the algorithm firstly removes the clusters found by SOM that had few hits and then, when a test data is studied to be classified as anomaly or not, the algorithm considers *k* clusters (being *k* a user parameter related to KNN algorithm) to reduce the influence of noise.

Data analysis and anomaly detection

To validate this approach, we defined a study in which we tried to detect three kinds of anomalies:

Activity duration.

No activity duration.

Start time of an activity.

In this way, we are motivated to detect if the patient uses a specific device at an anomaly hour or if in contrast, the user does not use a device during a long period of time (for example, if the user does not use the fridge for 3 days). In a first analysis, let's consider the activity data from sensor 5893, that refers to a motion sensor installed in the kitchen. Image 1 shows when motion was detected in the kitchen (on the left) and when it was not (on the right).

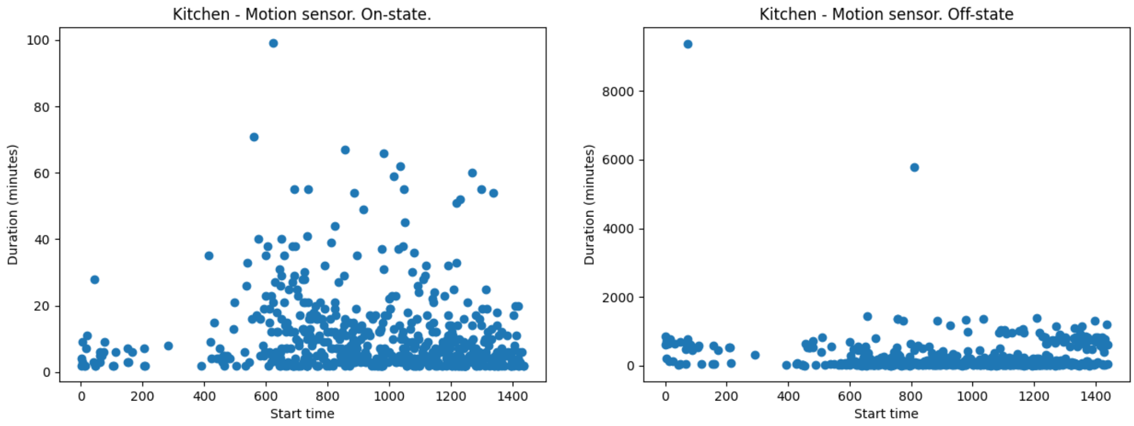

Image 1: Data distribution of sensor 5893.

In addition to the activity data distribution, images 2 and 3 show a histogram of the data considering not only the activity duration but the start time.

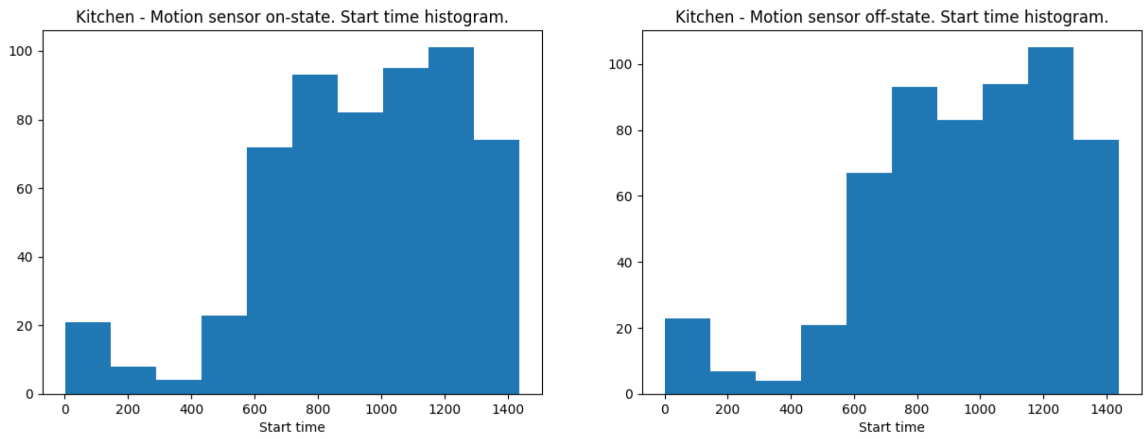

Image 2: Start time histogram.

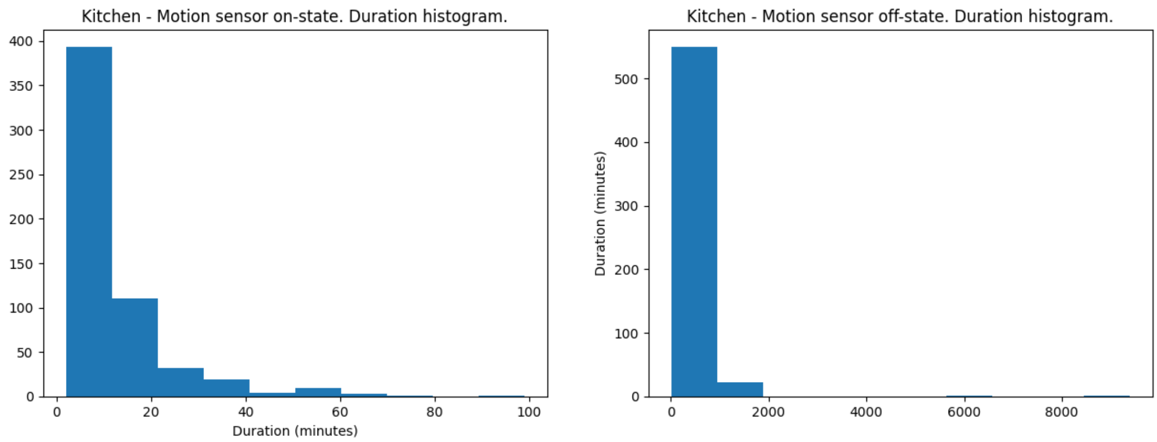

Image 3: Activity duration histogram.

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After analysing the data distribution and the histogram of image 2, we hypothesized that the activity data that occurs between 3 am and 6 am could be considered as an anomalous behaviour. On the other hand, taking into account the activity duration of image 3, it seems to be that longer activities than 20-30 minutes could be anomalous in on-state data, whereas activities longer than 1 day suppose a strange behaviour in off-state data. It is important to note that classifying these instances as anomalies does not mean that the user is suffering a health problem, however it would be interesting to analyse the behaviour of that specific days just to verify If it was a sensor issue or if, in contrast, the user had any health problem.

We believe that an appropriate anomaly detector algorithm should classify, at least, the data points discussed previously as anomalous. Images 4 and 5 show the results of the hybrid approach for the aforementioned data.

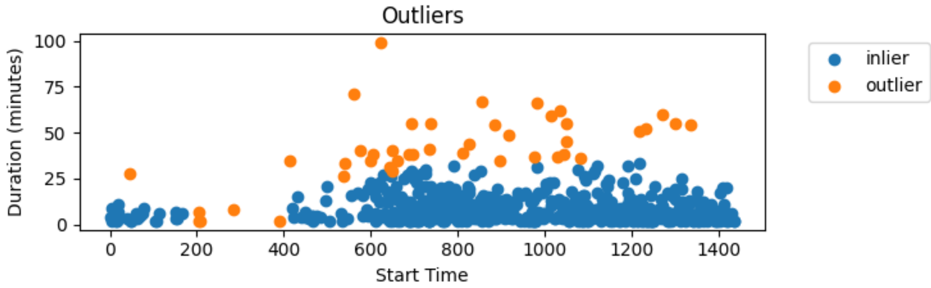

Image 4: SOM+KNN algorithm over kitchen on-state sensor data.

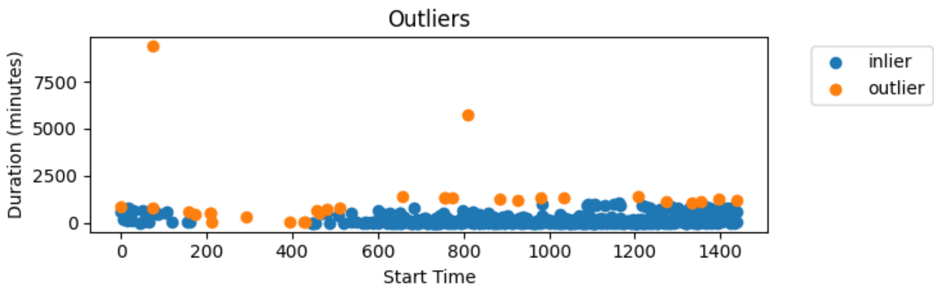

Image 5: SOM+KNN algorithm over kitchen off-state sensor data.

Note that for both on-and-off activity measures, the hybrid approach was able to detect the activity data that occurs at an anomalous time (between 3 am and 6 am) and with an infrequence duration time. However, the algorithm seems to be very sensitive and classifies data that might not be anomalous, such as the detected anomalies before 3 am in the off-state data.

Finally, results for anomaly detection in sensors 5891 (motion living room), 6127 (tv device – living room), 5892 (motion bedroom) and 6523 (fridge device – kitchen) are shown in the following sections. For each data sensor we display histograms for the activity duration and start time together the anomalies detected by SOM+KNN. To

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achieve a more readable document, a similar analysis like the provided over the kitchen sensor data can be derived for the results coming from sensors: living room, tv and bedroom. However, a specific analysis is described in detail on the fridge sensor data due to it behaviour is slightly different.

Fridge sensor data

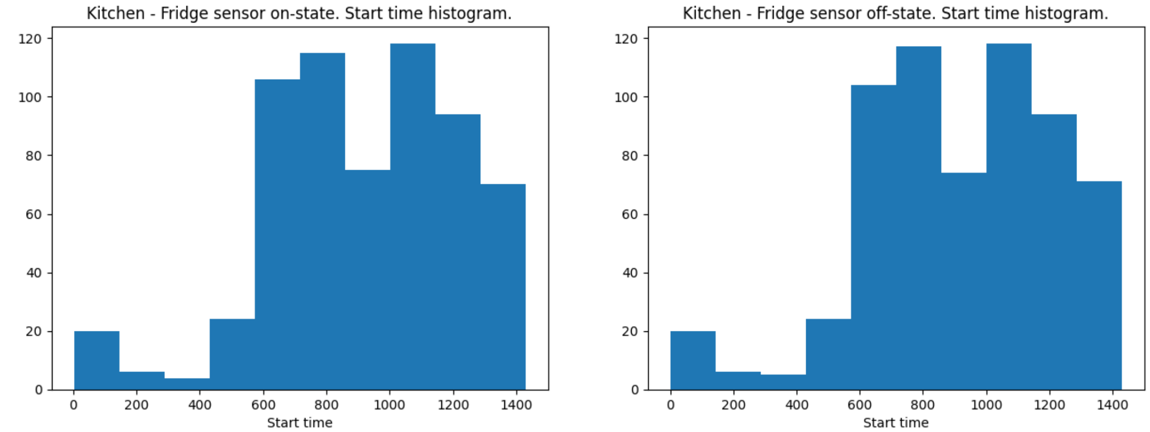

Image 6: Start time histogram

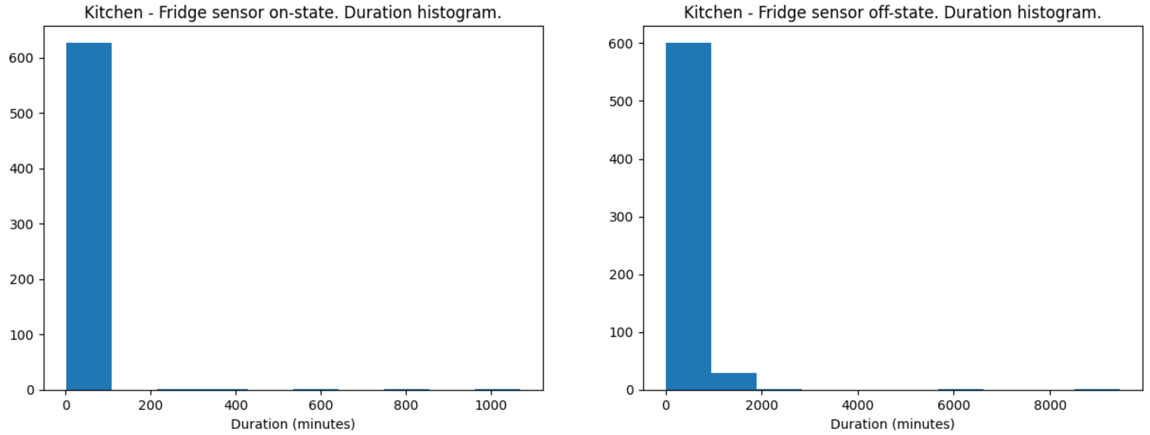

Image 7: Activity duration histogram

Images 6 and 7 gathers the histograms for start time and activity duration respectively. Firstly, analysing the histogram of Image 6 we could consider that a "normal" behaviour is all activity comprised between 6 am to 3 am. On the other hand, with regards to the activity duration we assume that fridge usages lesser than 50 minutes are very frequent whereas an inactivity greater than 16 hours could suggest an anomalous behaviour.

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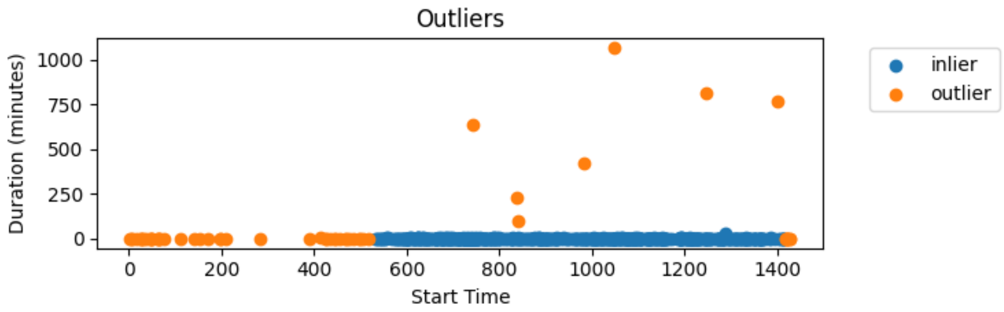

Image 8: SOM+KNN algorithm over fridge on-state sensor data.

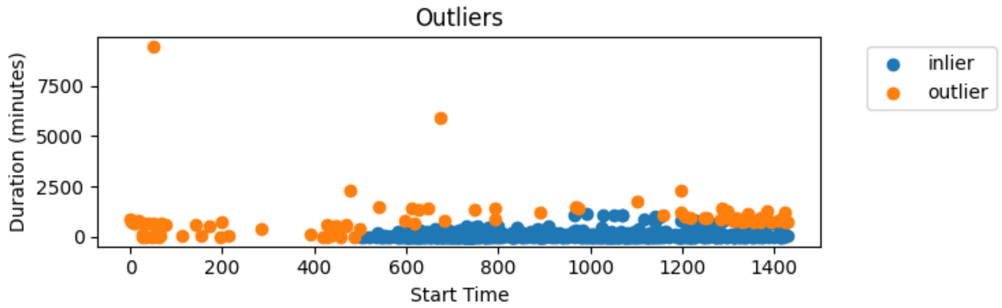

Image 9: SOM+KNN algorithm over fridge on-state sensor data.

The data distribution of this home appliance is quite different compared to other sensors used in this research. There are 4 data points that represent a fridge usage of more than 8 hours and another 3 points that represent a usage of around 4 hours, which seems to be a strange behaviour. Although our hybrid approach was able to find these anomaly duration points, it had a wrong behaviour considering the start time activity. In these cases, we might consider removing the noisy data, tune the algorithm parameters and explore new solutions. Therefore, Image 10 shows how after removing the aforementioned noisy data, the algorithm achieved a more reasonable solution.

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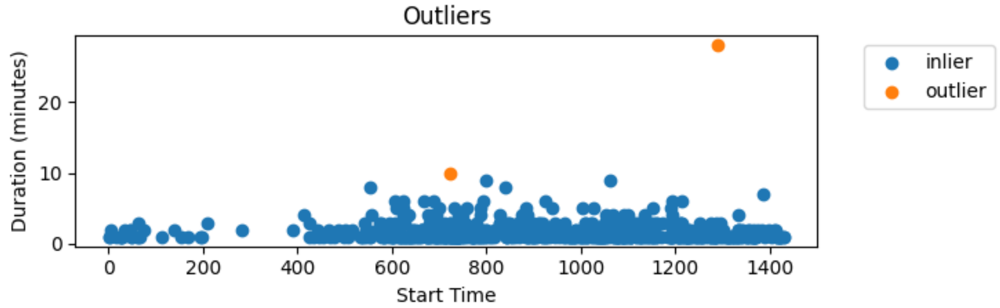

Image 10: SOM+KNN algorithm over fridge on-state sensor data after removing noisy data.

Motion living room sensor data

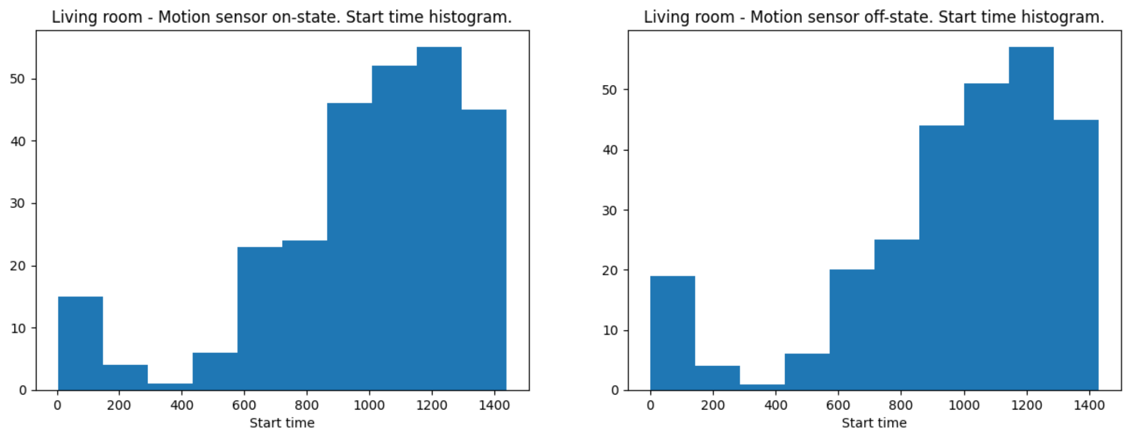

Image 11: Start time histogram.

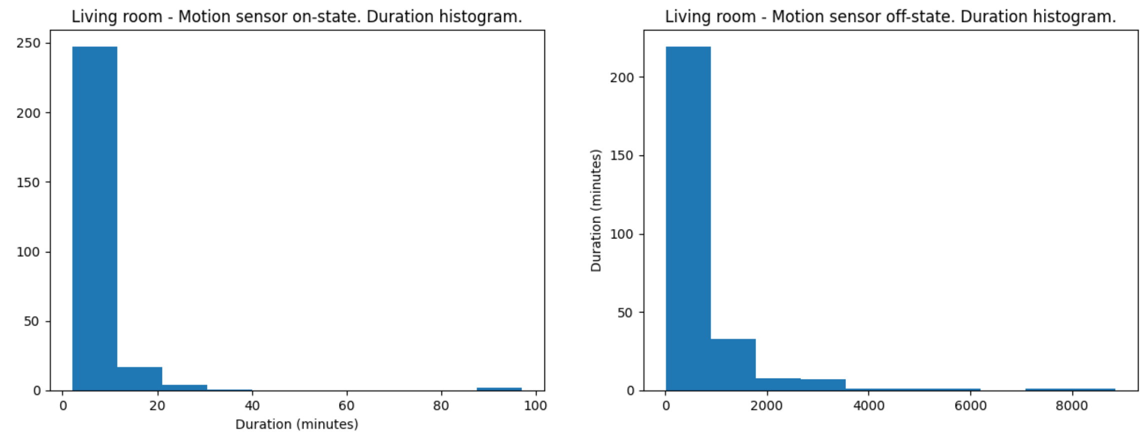

Image 12: Activity duration histogram.

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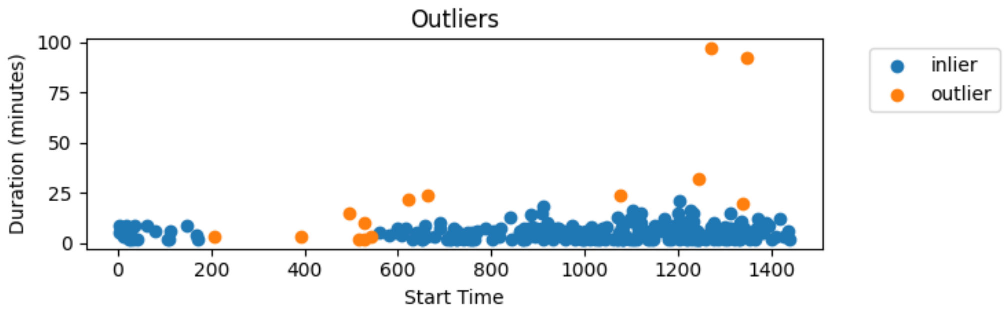


Image 13: SOM+KNN algorithm over motion living room on-state sensor data.

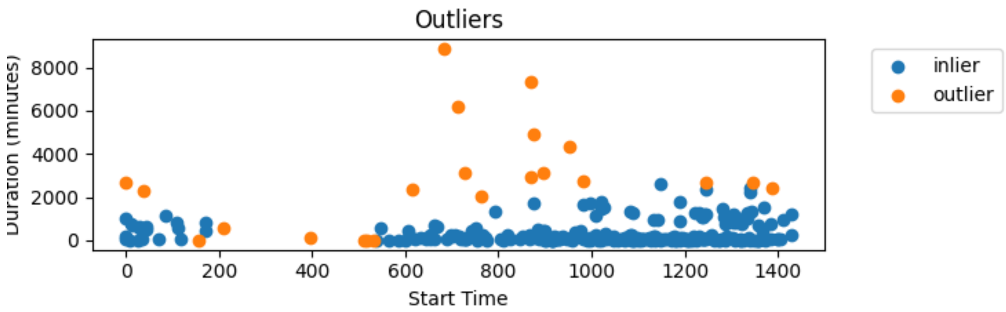
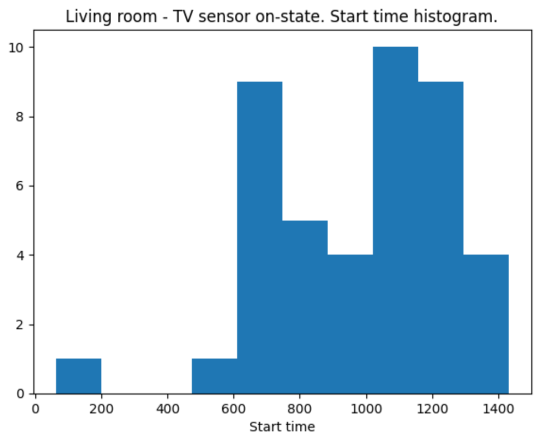


Image 14: SOM+KNN algorithm over motion living room off-state sensor data.

TV sensor data



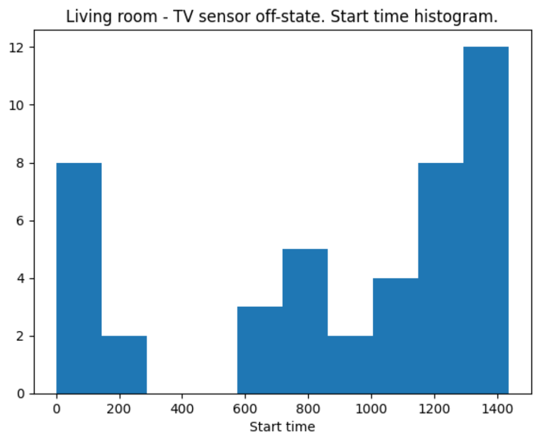


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Image 15: Start time histogram.

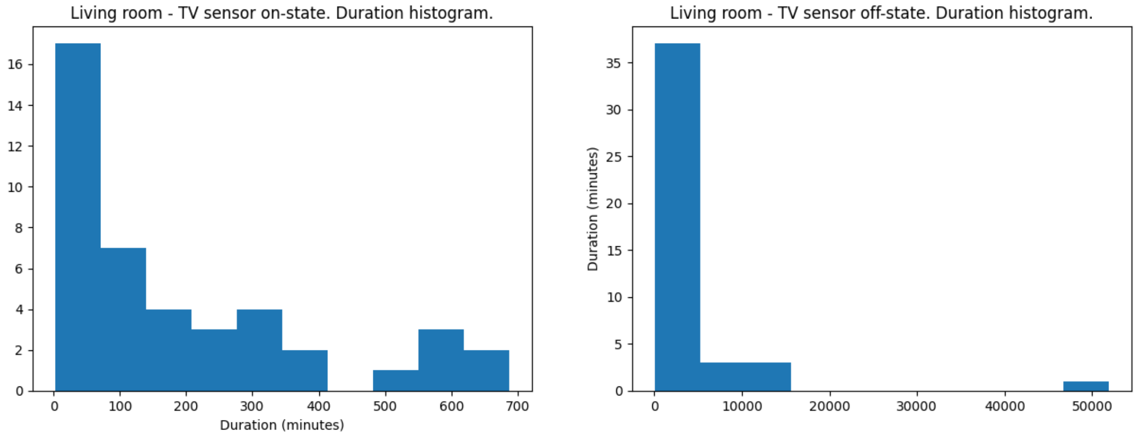

Image 16: Activity duration histogram.

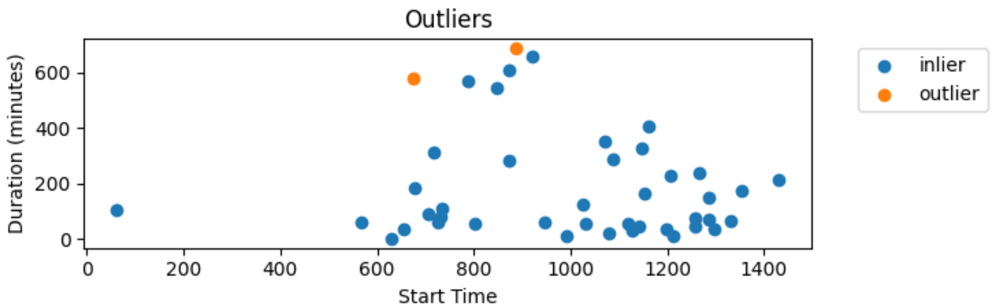

Image 17: SOM+KNN algorithm over TV on-state sensor data.

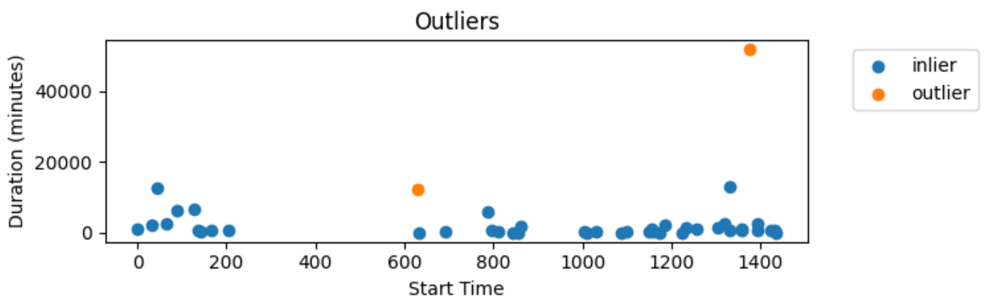

Image 18: SOM+KNN algorithm over TV on-state sensor data.

Motion bedroom sensor data

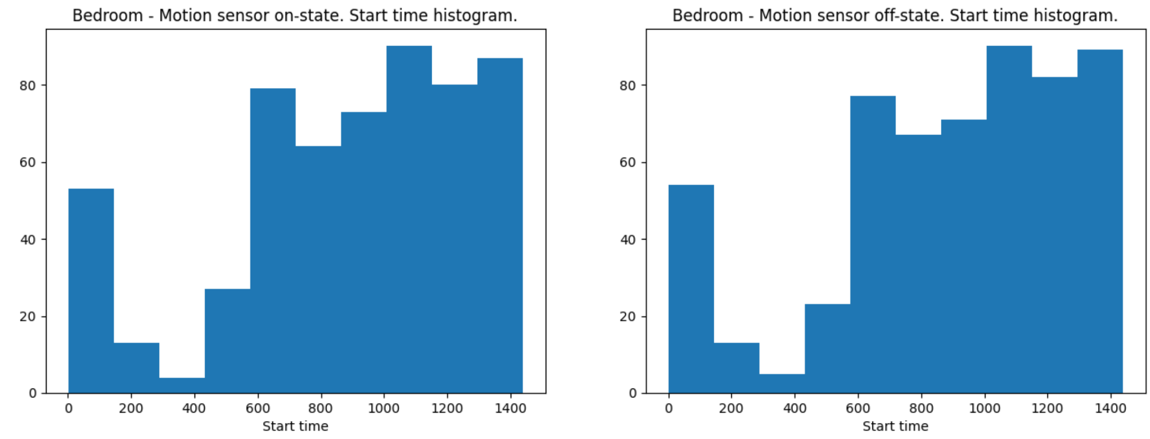

Image 19: Start time histogram

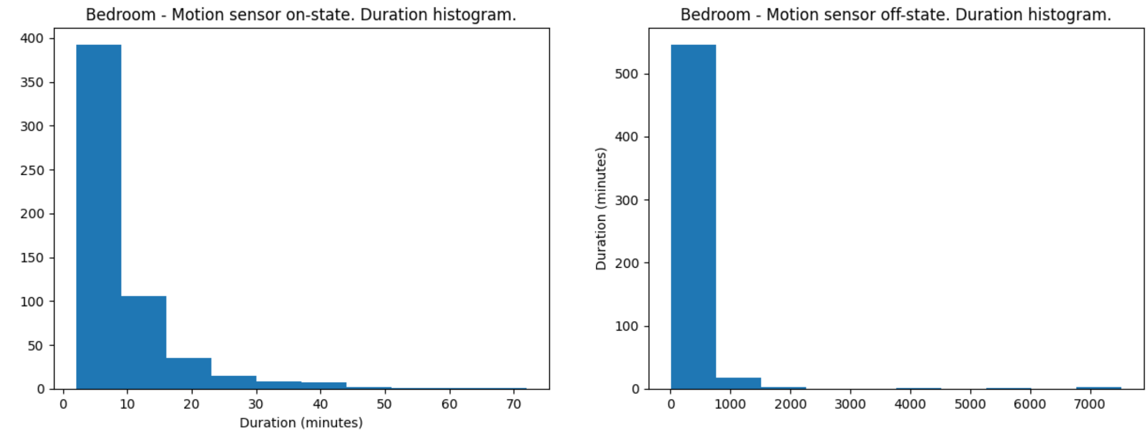

Image 20 Activity duration histogram

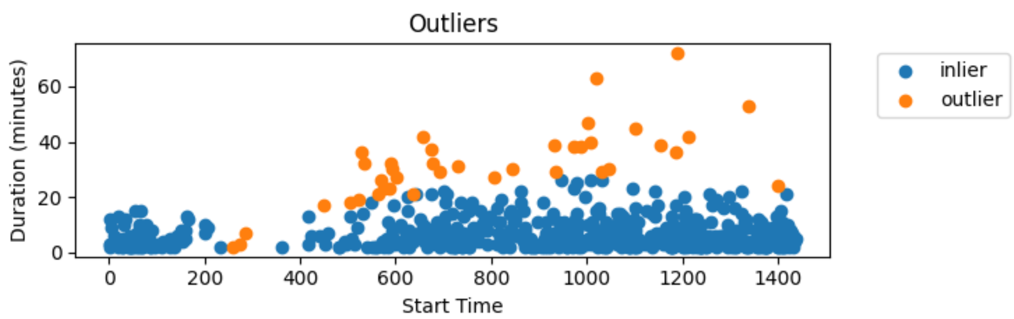

Image 21: SOM+KNN algorithm over motion bedroom on-state sensor data.

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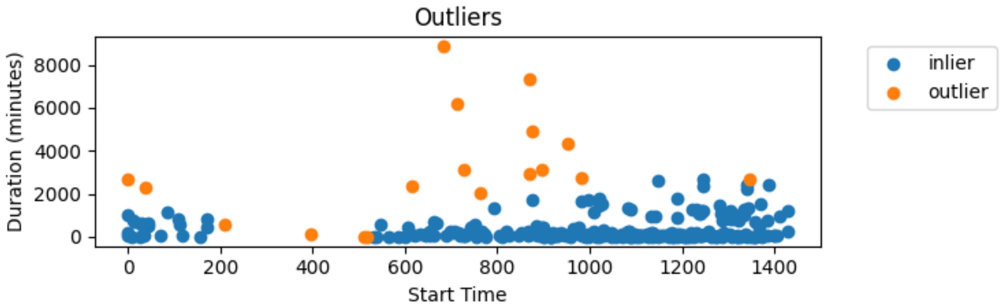

Image 22: SOM+KNN algorithm over motion bedroom on-state sensor data.

Conclusions

In this work we were motivated to study if we can detect anomalies in the behavior of older people living independently. Our first proposal was to use data coming from a set of IoT sensors installed at home. However, the data collected is undistinguished and we considered that we would not be able to conduct an adequate analysis. Nevertheless, after a thorough search, we found an open dataset that could be used for this purpose [1].

Since the data provided by the sensors only records the use of home appliances or whether the user is inside or outside a room, we are facing an unsupervised learning problem because we haven't got any data label. Then, our goal is to apply data mining techniques to define and to distinguish between "normal" and "anomalous" user behavior.

For that purpose, we implemented a hybrid anomaly detection algorithm that combines SOM neural networks and KNN (SOM+KNN algorithm). The experiments carried out was structured to detect three kinds of anomalies:

Activities duration anomalies.

No activities anomalies.

Activities that start at not common hours.

For each sensor, we displayed a histogram of the data activity and a scatter of the data distribution, highlighting the potential anomalies suggested by the SOM+KNN algorithm. From the analysis carried out in this work, we would like to remark the following aspects:

In unsupervised learning problems in general and with regards to data mining problems, it is still necessary the human intervention when analysing the results and determine the quality of the solution. For this reason, in the analysis carried out we included both a histogram and a scatter of the data distribution to graphically validate

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the results thrown by the anomaly detection algorithm. In this way, it is also important to know the problem domain and to analyse together with the experts the meaning and feasibility of the results.

Having a quality dataset that is representative of the problem is a crucial aspect to consider in any machine learning problem, especially when we face an unsupervised learning problem where we don't have any labels.

The hybrid anomaly detector algorithm implemented was able to achieve promising results. One of the main strengths of the algorithm we have used is that it can be more or less restrictive in determining whether a data is an outlier. This happens due to two main aspects: (I) the algorithm first analyses the clusters created by SOM and removes those that had few hits (less relevant) and (ii) the fact of using KNN to determine whether or not a data is an outlier by comparing it not only with a BMU but also with the *k* closest BMUs makes it easier to adjust the type of sensitive we want to have to classify a data as anomalous.

Dashboard

In addition to the anomaly detection algorithm, we have designed a dashboard in order to help experts easily understand the analyses described above and to facilitate their decision making.

The dashboard consists of three main components: start page (Image 23), sensor activity distribution (Image 24) and anomaly studies (Images 25 and 26). The start page displays a summary of sensor activity data (on the right of Image 23) and the number of detected anomalies distributed between each sensor (on the left of Image 23). Note that in this study, most of the anomalies detected refer to the sensor that monitors the fridge. Throughout this analysis we will study in detail some anomalous cases of this sensor.

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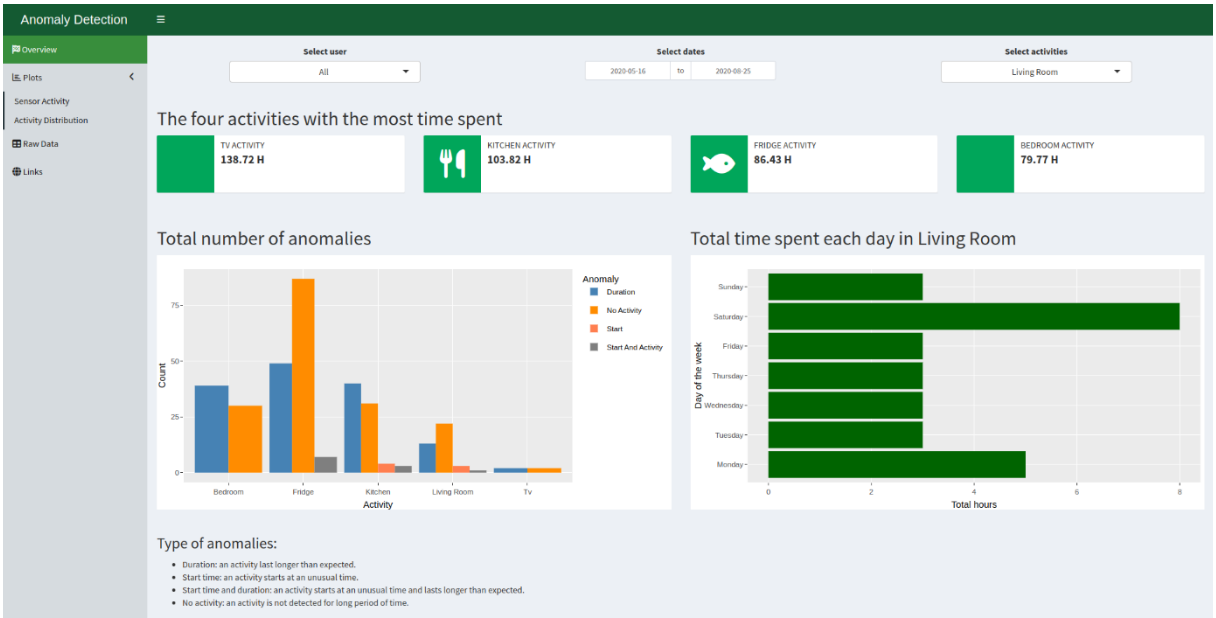

Image 23: Start page dashboard

Moreover, a similar analysis to the one we have done in the previous section can also be performed in the dashboard, as is shown in Image 24. For this analysis we can select both the date (circled in red) on which we are interested in performing the study and the activity sensor (circled in blue).

Image 24: Scatterplot about sensor activity data and representation of the detected anomalies.

On the other hand, to analyse both the user behaviour and the anomalies detected and help the experts with the analysis, the dashboard gathers two kinds of representation: activity (Image 25) and non-activity data (Image 26).

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1) Activity data analysis

The activity data representation of Image 25 shows in a unique plot the behaviour of the user during a whole day, in terms of the activity registered for each sensor. In this way, the time (in hours) is shown on the abscissa axis whereas the ordinate axis gathers each sensor activity. Besides, we can differentiate two kinds of rectangles: those that are solid coloured (normal activity) and those with a grey background (anomalous activity). In this case, our anomaly detection algorithm highlighted an anomalous behaviour on the fridge sensor data because it was registered that the fridge was opened during two hours at 2pm and during almost 7 hours at 4.30 pm. The remaining activity sensors sems to be "normal".

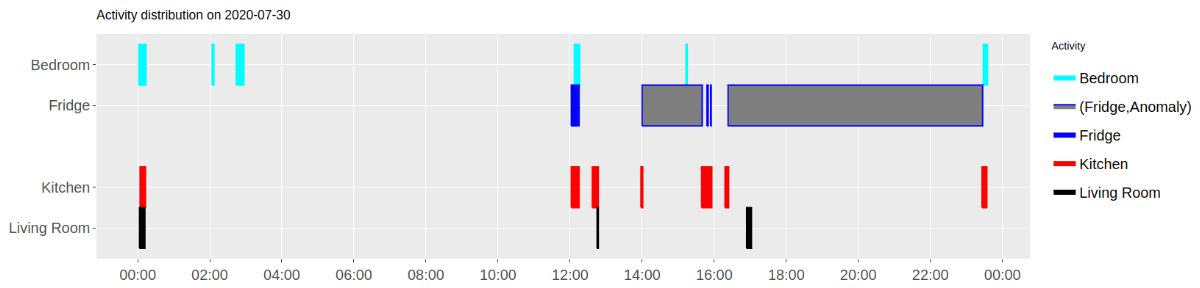

Image 25: Data representation of an activity day.

2) No activity data analysis

As the reader will have noticed, the distribution of activity data compared to the non-activity data is quite different. While for the activity data we find data ranges from 0 to 100 minutes, for the inactivity data we find durations up to 8000 minutes. We believe that these differences in the domain for the two types of anomalies may hinder the analysis performed. Therefore, Image 23 shows an example of inactivity data for August 2020. According to this image, in August there was an anomalous behaviour of all sensors: firstly, the TV device was turned off during all month but in contrast, the motion sensor installed on the living room (purple bar) suggests that could be activity on the living room during the first fortnight. On the other hand, regarding the sensors installed on the kitchen there were at least four different timestamps of two days in which the user didn't use the fridge. Finally, there were two timestamps of two days in which the motion sensor installed on the bedroom didn't capture any movement on the room. All these facts could suggest:

The user was away from home during the month and the sensor measurements are wrong data.

The user had an anomalous behaviour that could indicate a health problem.

Thanks to the dashboard, experts can study this kind of behaviours in an easy way and study it carefully.

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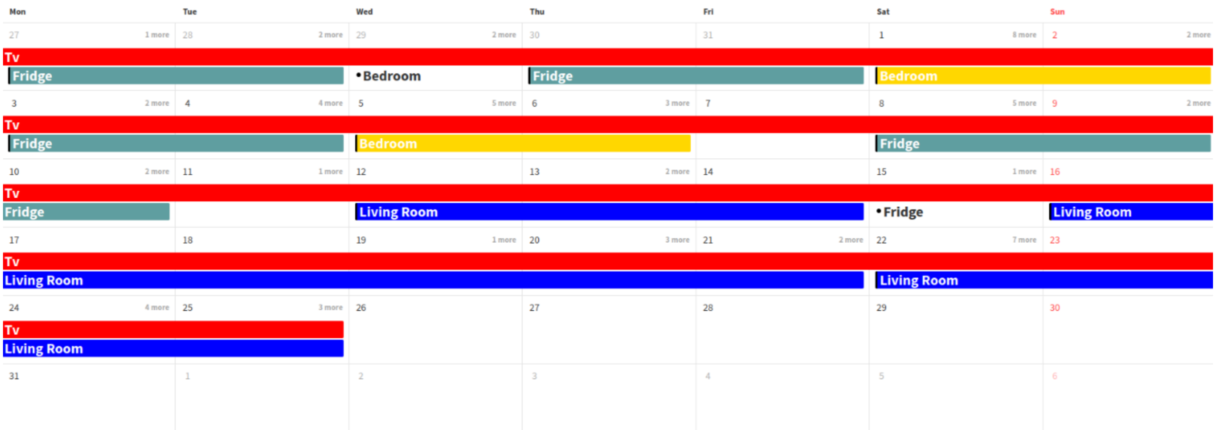

Image 26: Data representation of non-activity days.

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Annex 2

Data plan UC-PT1-001

Outcome	Domain	Type of variable	Frequent of assessment
General data (i.e. data related with all pilot goals/covariates)			
Caregiver data			
Caregiver age	Socio-demographic	Discrete	Baseline (T0)
Caregiver highest educational degree	Socio-demographic	Nominal	Baseline (T0)
Caregiver spatial distance to care receiver	Socio-demographic	Continuous	Baseline (T0)
Internet-related variables with regard to care receiver			
Access to device with internet connection at least twice a week (inclusion criteria; Yes/No)	ICT use characterization	Dichotomous	Baseline (T0)
Skilled to use internet (inclusion criteria assessed by referral of participants; Yes/No)	ICT use characterization	Dichotomous	Baseline (T0)
Frequency of internet use	ICT use characterization	Discrete	Baseline (T0)
Caregiving-related data			
Type of care provided (Formal vs. informal)	caregiving characterization	Nominal	Baseline (T0)
Duration of care provision (in years)	caregiving characterization	Continuous	Baseline (T0)
Frequency of care provision (number of hours per week)	caregiving characterization	Discrete	Baseline (T0) / Continuous data

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			collection (at half and end of phase)
Existence of other care providers (Yes/No)	caregiving characterization	Dichotomous	Baseline (T0) / Continuous data collection (at half and end of phase)
Relationship with the care receiver	caregiving characterization	Nominal	Baseline (T0)
Cohabitation with the care receiver (Yes/No)	caregiving characterization	Dichotomous	Baseline (T0) / Continuous data collection (at half and end of phase)
Care receiver data			
Care receiver age	Socio-demographic	Discrete	Baseline (T0)
Care receiver gender	Socio-demographic	Nominal	Baseline (T0)
Degree of dependence (subjectively evaluated by the informal caregiver)	Disease characterization	Nominal	Baseline (T0) / Continuous data collection (at half and end of phase)
Individual top three challenges	Socio-demographic	Nominal	Baseline (T0)
Use Case 1 (Wellbeing Assessment)			
Wellbeing scores (WHOQOL-OLD, daily survey)	Wellbeing	Discrete	Baseline (T0) / Continuous data collection (at half and end of phase)
Status of home appliances (on/off)	Surrogate for Wellbeing	Dichotomous	Continuous data collection (daily)
Time / duration of home appliance status	Surrogate for Wellbeing	Continuous	Continuous data collection (daily)
Physical activity data (daily steps)	Surrogate for Wellbeing	Continuous	Continuous data collection (daily)
Sleep data (duration, begin / end, wake ups at night, time per sleep stage)	Surrogate for Wellbeing	Continuous	Continuous data collection (daily)

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air quality (temperature, humidity, PM, CO_2)	Surrogate for Wellbeing	Continuous	Continuous data collection (daily)

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Annex 3

MOMENTUM UC-PT1-001

7 List of indicators

For ease of use, this section contains a complete list of the 51 indicators already presented sequentially in Sections 3-6 in the context of each individual critical success factor.

7.1 Context

7.1.1 CSF 1. Ensure that there is cultural readiness for the telemedicine service

- In my organisation/region doctors and other healthcare professionals are ready to share clinical information with each other and with the patient i.e., there is a level of trust among all the stakeholders.

YES. According to interviews in mock-ups, participants of the pilot conducted by CCS are willing to share activity data with them.

- In my organisation/region user and providers (healthcare professionals) are ready to use ICT (e.g., computers, tablets, mobile phones).

YES. Care providers at health region Saxony already use ICT in their daily work. Patients usually accepts new technologies as far as they have a clear benefit.

- In my organisation/region financial and other incentives are aligned with the service to be deployed.

TO DO. Financial strategy has to be developed.

- In my organisation/region an underpinning culture embraces technology.

YES. CCS is aware of the importance of incorporating cost-effective digital solutions. CCS regularly supports and leads projects to develop digital solutions for seniors and improve care.

- In my organisation/region an underpinning culture welcomes and even promotes change, innovation and shows openness to new ideas.

YES. CCS is a partner in several projects that promote the development of digital technologies in healthcare. CCS is in regular contact with relevant networks.

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7.1.2 CSF 2. Come to a consensus on the advantages of telemedicine in meeting compelling need(s)

- In my region/organisation there is general consensus on the current telemedicine solution being the best available solution for meeting a compelling need.

YES. The core business of CCS is the management and coordination of sustainable approaches to securing and improving healthcare, including video consultations or a digital therapy companion. The SHAPES App itself and the developed digital solutions are seen as a great tool to assist the user in daily activities.

- The current telemedicine solution is the best available solution for meeting a compelling need.

NOT SURE. The digital assistant as support in daily tasks and for alleviating isolation is still a research area, where more data is needed to optimise the type of interaction required for such goals.

7.2 People

7.2.1 CSF 3. Ensure leadership through a champion

- In my region/organisation there is one or several influential person(s) who take(s) on a leading role and leads the way towards deployment of the telemedicine solution tested in our project.

YES. CCS and MedicalSyn has developed a video consultation solution, which is used in several clinics of the University Hospital in Dresden.

7.2.2 CSF 4. Involve healthcare professionals and decision-makers

- Healthcare professionals have been involved in the development of the content of this project.

NO. The deployment of this use case did not foresee any participation of health care professionals and thus they have not been involved in the development.

- Healthcare professionals have been involved in the development of the process and time schedule for this project.

NO. The deployment of this use case did not foresee any participation of health care professionals and thus they have not been involved in the development.

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- Decision-makers have been involved in the development of the content of this project.

YES. Dr. Olaf Müller (former CEO of CCS) and Johannes Klaus (CEO of CCS) have been involved in the development of the content of this project, of the process and time schedule for this project.

- Decision-makers have been involved in the development of the process and time schedule for this project.

YES. Dr. Olaf Müller (former CEO of CCS) and Johannes Klaus (CEO of CCS) have been involved in the development of the content of this project, of the process and time schedule for this project.

7.2.3 CSF 5. Put the patient at the centre of the service

- In this project[17] the patients have been sufficiently involved in the development of the telemedicine solution.

YES. Older people representative of final users have been involved in mock-up presentations in phase 2, hands-on training sessions in phase 3 and piloting activities in phase 5.

- In this project telemedicine service is based on the patient´s needs.

YES. Objectives is to promote social activity and active healthy ageing. Studies show that seniors who stay socially active and engaged experience a variety of benefits, both in physical and psychological health.

- In this project enough information and training is provided for the patients in order for them to obtain the best results possible from using the telemedicine solution.

YES. Training will be included in the design of phase 3, 4 and 5.

7.2.4 CSF 6. Ensure that the technology is user-friendly

- The telemedicine technology used in our project is user-friendly for patients.

TO DO. It is the objective and great effort is done within the SHAPES consortium to define requirements to fulfil this.

- The telemedicine technology used in our project is user-friendly for health professionals.

NO. User experienced is centred on the care receiver and care giver.

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- The telemedicine technology used in our project does not need an extended training process prior to using it.

YES. Half-day training is expected to be sufficient.

7.3 Plan

7.3.1 CSF 7. Pull together the resources needed for deployment

- In my region/organisation the financial resources needed for deployment of the telemedicine solution are available.

YES. SHAPES and already allocated internal resources are provided (for pilot).

- In my region/organisation the IT competences needed for deployment of the telemedicine solution are available.

YES. CCS staff is able to provide IT competences.

- In my region/organisation enough time for the training needed in order to implement the telemedicine solution is available.

YES. It is included in the SHAPES agreement.

7.3.2 CSF 8. Address the needs of the primary client(s)

- The telemedicine solution addresses the needs of the primary clients.

YES.

Older people living alone at home are the clients. The digital assistant provides support in daily activities, securing an autonomous life at home.

- The telemedicine solution is sufficiently adapted to the needs of the primary users.

YES. Needs were defined based on interviews with older people and caregivers.

- The telemedicine solution addresses the needs of the health sector.

NO: The primary objective of the digital solutions are to support older people at home. It does not take medical issues into account.

- The telemedicine service addresses the needs for efficiency improvement and improvement of quality in the health sector.

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NO. The digital assistant could increase the quality of life the seniors but is not affecting the efficiency or quality in the health care sector directly.

- The telemedicine service is adapted to the need for cooperation between municipalities.

NO.

- The telemedicine service is adapted to the need of the health sector for interaction in with the principle of Best Efficient Level of Care.

NO.

17 The wording of these indicators tends to focus on use of the word project. However, in many telemedicine settings, words such as service or initiative or venture might prove to be more suitable. Alternatively, organisation or region might also be considered.

7.3.3 CSF 9. Prepare and implement a business plan

- A business plan for the project has been developed.

To do (D7.3 SHAPES Business Plan WP7)

- A business plan for the project has been implemented.

To do after the pilot.

- The business plan has been approved by the relevant management level.

To do after the pilot

7.3.4 CSF 10. Prepare and implement a change management plan

- A change management plan for the project has been developed.

To do after the pilot.

- A change management plan for the project has been implemented.

To do after the pilot.

- A change management plan has been approved by the relevant management level.

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To do after the pilot.

7.3.5 CSF 11. Assess the conditions under which the service is legal

- Prior to the start of the project, we assessed the conditions under which the service is legal.

YES. Completing a Data Protection Impact Assessment (DPIA) identified and minimized any risks associated with the pilot with input sought from other WP and the SHAPES Data Protection Officer at CCS. Data processing agreements will be established with relevant partners to permit access to pseudonymized data.

7.3.6 CSF 12. Guarantee that the technology has the potential for scale-up

- We are fully aware of what it takes for the technology to be deployed on a large scale.

To do after pilot. Scaling up of the digital assistant manufacturing is a complex process and needs to be evaluated along with the cost-efficiency analysis.

- In our region/organisation we are ready for large-scale deployment of the technology.

YES. CCS is working together with several facilities providing education for older seniors who are willing and interested to use digital solutions in their daily life.

- The project will supply the documentation needed to ensure that there is a basis for large-scale deployment of the project.

To do after the pilot.

7.4 Run

7.4.1 CSF 13. Identify and apply relevant legal and security guidelines

- The project is carried out in accordance with the relevant guidelines on legal matters.

YES. CCS was in contact with several DPOs.

- The project is carried out in accordance with the relevant guidelines on security matters.

YES. GDPR will be applied. The system provided implements all security and privacy related regulations.

7.4.2 CSF 14. Involve legal and security experts

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- We have received advice on the project from legal experts.

YES. We worked with LAUREA, with extensive expertise in this field and with VICOMTECH, who was awarded with the ISO 27001 certification for information security management.

- We have received advice on the project from experts on data security matters.

YES. CCS worked with SHAPES partners to implement a data management plan.

- In this project we are not experiencing any data security problems.

NO. However a risk assessment regarding data management will be developed and updated to foresee any potential data security problems.

- I have confidence in the legality of this project.

YES. It's a H2020 project with partners with extensive expertise in this field (LAUREA for example).

- I have confidence in the security of this project.

YES. It's a H2020 project with partners with extensive expertise in this field (HMU and PAL for example).

7.4.3 CSF 15. Ensure that telemedicine doers and users are privacy aware

- In this project the telemedicine doers are aware of protecting the patients´ privacy in terms of health information and other information collected during the course of the pilot.

YES. CCS works with data protection protocols. They will be also instructed the application of data protection with the new technologies introduced in the pilot. Older people and informal caregivers will be informed about data collection and process and consents will be collected.

7.4.4 CSF 16. Ensure that the information technology infrastructure and eHealth infrastructure are available

- We have ensured that the IT infrastructures needed are in place for deployment and large-scale implementation.

YES. Large-scale implementation will be evaluated after the pilot.

- We have ensured that the eHealth infrastructures needed are in place for deployment and large-scale implementation.

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NOT SURE. All parts of the infrastructure are provided by SHAPES partners.

7.4.5 CSF 17. Put in place the technology and processes needed to monitor the service

- We have set up a system to monitor our telemedicine service ensure that it is running smoothly at all times.

YES. In case of any bugs or issues the development team from the involved tec partner will fix it.

- We have set up a system to solve any incident that may occur during the service.

NOT SURE. The users get a support hotline during the different phases with a responsible contact person.

- We have a system which supports the end-users in resolving any doubts that they might experience with the telemedicine solution.

YES. Apart from the user manual, CCS ensures a direct communication to the participants.

7.4.6 CSF 18. Establish and maintain good procurement processes

- We have clear agreements regarding the quality of the deliveries provided by our vendors.

All technologies in current version of the technology come from SHAPES partners.

- We have clear agreements regarding the service level provided by our vendors.

All technologies in current version of the technology come from SHAPES partners.

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Annex 4

NASS UC-PT1-001

NASSS-CAT (PROJECT VERSION)

FOR MONITORING PROJECT COMPLEXITY OVER TIME

This version of the NASSS-CAT is intended to be used when you are setting up and running a specific project to implement a new technology in a health or care setting. You may be asked to complete it more than once as the project unfolds. Score one point for every 'agree' answer and add up the orange column. In the blue column, tick if you think this issue is going to get more complex in the next phase of the project. Note: this tool will only give you a semi-quantitative estimate because some aspects of a project will be more important than others.

STRATEGIC COMPLEXITIES	*Agree*	*Disagree*	*Not applicable or don't know*	*Likely to get more complex in next phase*
1. The vision and benefits for the project are not yet clear		*x*		
2. The fit between this technology and the organisation's mission and strategy is poor		*x*		
3. The business case for the work is unclear or contested	*1*			*1*
4. The scope of the project is unclear or contested		*x*		
5. The work will have major knock-ons for other key projects and business-as-usual operations	*1*			
6. Success criteria are not yet explicitly set out and agreed by key stakeholders		*x*		

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7. The project's success could be threatened by external changes that impact on the organisation	*1*			
TOTAL STRATEGIC COMPLEXITY SCORE	*3/7*			*1/7*

	Agree	*Disagree*	*Not applicable or don't know*	*Likely to get more complex in next phase*
TECHNICAL COMPLEXITIES				
1. The technology does not yet exist in a robust and dependable form	*1*			*1*
2. The technology is unfamiliar to the project team		*x*		
3. The technology supply chain is not yet in place	*1*			
4. The technology cannot be installed until the system is upgraded (e.g. hardware, bandwidth)	*1*			
5. A key technology needs to be installed across multiple technical systems to achieve 'integration'	*1*			
6. Introducing the technology will require significant changes in care pathways and organisational routines		*x*		
7. Quality standards and regulatory requirements for using the technology in a health/care setting have not been fully defined (or key stakeholders don't know about them or accept them)	*1*			*1*
TOTAL TECHNICAL COMPLEXITY SCORE	*5/7*			*2/7*

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OPERATIONAL COMPLEXITIES		*Agree*	*Disagree*	*Not applicable or don't know*	*Likely to get more complex in next phase*
1. A schedule and resource plan have not yet been defined			*x*		
2. The pace of the project (time to achieve key goals and milestones) seems unachievable			*x*		
3. The budget is insufficient for the task or there is limited flexibility in how the budget can be used			*x*		
4. Resources (e.g. test facilities, equipment) may not be available when needed		*1*			*1*
5. Evaluation measures and metrics have not yet been agreed		*1*			*1*
6. Accurate, timely and comprehensive data reporting will be difficult or impossible			*x*		
7. New management tools and data sources will be needed to guide, monitor and evaluate the project				*1*	
TOTAL OPERATIONAL COMPLEXITY SCORE		*2/7*		*1*	*2/7*

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	Agree	*Disagree*	*Not applicable or don't know*	*Likely to get more complex in next phase*
PEOPLE-RELATED COMPLEXITIES				
1. The people leading the project are inexperienced in this kind of work	*1*			
2. The people leading the project do not have adequate control over project staff (e.g. no direct reporting)		*x*		
3. There are not yet sufficient people with the right skills available to participate in the project.		*x*		
4. There are no key people who are wholly allocated to the work for the project		*x*		
5. Lines of responsibility for tasks and deliverables are not yet defined		*x*		
6. Team members have limited confidence in the technology or do not fully understand how to use it		*x*		
7. Team members have limited motivation and are not yet functioning well as a team		*x*		
TOTAL PEOPLE-RELATED COMPLEXITIES	*1/7*			*0/7*

	Agree	*Disagree*	*Not applicable or don't know*	*Likely to get more complex in next phase*
"POLITICAL" COMPLEXITIES				
1. The work does not have a senior sponsor in the organisation who recognises its importance and helps negotiate its progress		*x*		
2. The senior management team in the relevant department does not fully support the work		*x*		
3. Substantial work will be needed to bring people on board and develop a shared vision for the change		*x*		

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4. People beyond the core team don't understand the project or have unrealistic expectations for it		*x*		
5. People beyond the project team don't support the project or are not aligned or have insufficient time		*x*		
6. The core team does not have the authority to make decisions		*x*		
7. The work will require cooperation across sectors (e.g. health / social care)	*1*			*1*
TOTAL "POLITICAL" COMPLEXITY SCORE	*1/7*			*1/7*

Plot your scores on the radar charts below to get a quick visualisation of the different complexities as assessed by you. The one on the left is your assessment of current complexity (orange columns above); on the right is your assessment of emergent complexity (blue columns above). Compare your radar charts with those made by your colleagues. Do your charts look the same? If not, where are the discrepancies and what explains these?

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Annex 5

Information sheet for the participants

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_5_-PT1_UC001_Information-sheet-participants.pdf

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Annex 6

Consent form for the participants

EINVERSTÄNDNISERKLÄRUNG DER TEILNEHMER / Pilot 1

Titel der Studie:

Projekt **SHAPES** – **S**mart and **H**ealthy **A**geing through **P**eople **E**nganging in supporting **S**ystems – Intelligentes und gesundes Altern durch die Entwicklung und Nutzung von unterstützenden / digitalen Systemen

Pilotstudie 1 – Smart Living Environment for Healthy Ageing at Home – Intelligente Wohnumgebung für ein gesundes Altern zu Hause

Fallbeispiel 1: Wohlbefinden – Fernanalyse und –bewertung des Wohlbefindens zu Hause

Fallbeispiel 2: Digitaler Assistent – Ein digitaler Assistent zur Unterstützung des unabhängigen Lebens zu Hause und zur Aufrechterhaltung des sozialen Netzwerks

Fallbeispiel 3: Videotelefonie – Überwindung der Angst vor digitalen Technologien, kompetente Nutzung von Technologien und Problemlösung in der Gemeinde

Studienort:

Carus Consilium Sachsen GmbH

Fetscherstraße 74

01307 Dresden

SHAPES Pilotverantwortliche:

Ich bin eingeladen worden, an der oben genannten Forschungsstudie teilzunehmen. Der Zweck der Studie ist das Testen digitaler Technologien entsprechend der genannten Fallbeispiele für ein gesundes Altern zu Hause.

Ich habe das Informationsmaterial für Teilnehmer gelesen und verstanden. Das Informationsmaterial hat mich ausreichend über die oben genannte Studie, deren Zweck und Durchführung, über meine Rechte sowie über Nutzen und Risiken informiert. Ich hatte die Möglichkeit, Fragen zur Studie zu stellen und habe diese zufriedenstellend beantwortet bekommen.

Ich wurde ausreichend über die Erhebung, Verarbeitung, Weitergabe, Veröffentlichung und Löschung meiner persönlichen Daten während der Studie informiert. Der Datenschutzhinweis war als Teil der Teilnehmerinformationen des SHAPES-Projekts verfügbar.

Mit meiner Unterschrift bestätige ich, dass ich freiwillig an dieser Studie teilnehme und auch der Verarbeitung meiner persönlichen Daten zu den in diesem Dokument und im Datenschutzhinweis beschriebenen Zwecken zustimme.

Ich wurde nicht unter Druck gesetzt oder zur Teilnahme überredet und ich hatte ausreichend Zeit, mir meine Teilnahme an der Studie zu überlegen. Mir ist bewusst, dass meine Teilnahme völlig freiwillig ist und dass ich meine Zustimmung jederzeit ohne Angabe von Gründen zurückziehen kann.

Ich habe auch das Recht, die Löschung meiner identifizierbaren persönlichen Daten in Übereinstimmung mit den Datenschutzbestimmungen zu verlangen. Mir ist auch bekannt, dass im Falle meines Rücktritts von der Studie oder des Widerrufs meiner Einwilligung alle Daten, die vor meinem Rücktritt erhoben wurden, in die Forschungs-/Entwicklungs-/Innovationsdaten aufgenommen werden können.

Datum und Ort

Unterschrift des Teilnehmers Name des Teilnehmers in Druckbuchstaben

Anlage 1: Informationsmaterial über Projekt SHAPES und Pilotstudie 1

Anlage 2: Datenschutzerklärung und Datenschutzhinweise

Das vom Teilnehmer unterzeichnete Original der Einwilligung und eine Kopie des Aufklärungsbogens werden in den Unterlagen des Pilotleiters aufbewahrt. Der Aufklärungsbogen, der Datenschutzhinweis und eine Kopie der unterschriebenen Einwilligung werden dem Teilnehmer ausgehändigt.

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Annex 7

Data protection information

Anlage 2: Datenschutzhinweis für SHAPES-Forschungsdaten / Pilot 1

Im Rahmen des SHAPES-Projekts werden Ihre personenbezogenen Daten gemäß der Datenschutz-Grundverordnung der EU (DSGVO) und den geltenden nationalen Vorschriften verarbeitet. Alle Informationen, die wir im Rahmen unserer Untersuchungen sammeln, werden vertraulich behandelt und nur von Mitarbeitern unseres Forschungsteams im Rahmen der laufenden Studie verwendet. Die Weitergabe, Speicherung und Auswertung (Verarbeitung) der studienbezogenen Daten erfolgt nach gesetzlichen Bestimmungen ohne Namensnennung. Die Daten werden über eine gesicherte Verbindung zu unseren SHAPES-Projektpartnern weitergeleitet und gemeinsam ausgewertet. Ihre Einwilligungserklärung wird dabei getrennt von den Fragebogendaten und anderen gesammelten Daten direkt bei der Studienleitung aufbewahrt und nach Abschluss der Datenerhebung vernichtet. Im Falle einer Veröffentlichung der Ergebnisse der Studie ist kein Rückschluss auf Ihre Person möglich und die Vertraulichkeit Ihrer Daten bleibt in jedem Fall gewährleistet.

Die Verarbeitung der personenbezogenen Daten wird in den folgenden Punkten beschrieben.

<u>Datenschutzverantwortlicher des SHAPES-Projekts / Pilot 1</u>

Carus Consilium Sachsen GmbH

Fetscherstraße 74

01307 Dresden

Datenschutzbeauftragter:

<u>Kontaktperson für Angelegenheiten im Zusammenhang mit der Verarbeitung von personenbezogenen Daten</u>

Verantwortlich für die Durchführung der Studie:

Ansprechpartner bei Datenschutzverstoss:

<u>Arten von personenbezogenen Daten, die in dieser Studie erhoben werden</u>

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Im Rahmen der Teilnehmerrekrutierung: Name, Mailadresse, Anschrift, Telefonnummer, Geburtsdatum, Geschlecht

Im Rahmen der Accounterstellung: Name, Mailadresse, Alter, Geschlecht

Im Rahmen der Forschung & Erkenntnisgewinnung im Laufe des Projektes: digitaler Wissensstand, Fragebögen zur Digitalisierung, Fragebögen zum Wohlbefinden, Fragebögen zu digitalen Anwendungen, Daten aus den zu testenden Anwendungen entsprechend der drei einzelnen Fallbeispiele

Grundsätze zum Schutz personenbezogener Daten

Im Rahmen des SHAPES-Projekts werden Ihre personenbezogenen Daten grundsätzlich gemäß der Datenschutz-Grundverordnung der EU (DSGVO) und den geltenden nationalen Vorschriften verarbeitet und geschützt.

Nähere Informationen und Spezifikationen entnehmen Sie bitte den jeweiligen Anwendungen.

Fallbeispiel 1: Wohlbefinden – Fernanalyse und –bewertung des Wohlbefindens zu Hause

- Tablet mit SHAPES App mit Registrierung und Verknüpfung zu einzelnen Anwendungen;
- Smart Watch um Bewegung, Schlaf und Herzfrequenz zu erheben;
- Sensor für Monitoring elektrischer Geräte;
- Luftqualitätsmesser zur Bewertung der Luftqualität;
- Befragungssystem zum Wohlbefinden
- Nutzer/Angehörigenprofil

Fallbeispiel 2: Digitaler Assistent – Ein digitaler Assistent zur Unterstützung des unabhängigen Lebens zu Hause und zur Aufrechterhaltung des sozialen Netzwerks

- Tablet mit SHAPES App mit Registrierung und Verknüpfung zu einzelnen Anwendungen; Digitaler Assistent als Anwendung auf Tablet

Fallbeispiel 3: Videotelefonie – Überwindung der Angst vor digitalen Technologien, kompetente Nutzung von Technologien und Problemlösung in der Gemeinde

- Tablet mit SHAPES App mit Registrierung und Verknüpfung zu einzelnen Anwendungen;

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- Videotelefonie als Anwendung auf Tablet

Zu welchem Zweck werden die personenbezogenen Daten verarbeitet?

Im Rahmen des SHAPES Projekts werden bereits existierende als auch neue digitale Technologien / Anwendungen für das gesunde Altern zu Hause entwickelt und getestet. Es ist wichtig in diesem Prozess die zukünftigen Nutzerinnen und Nutzer einzubinden. In dieser Pilotstudie werden die Teilnehmer zu unterschiedlichen Zeitpunkten des Projektfortschritts im Rahmen von Befragungen, Testungen und Erlebnisberichten eingebunden. Die entsprechenden dazugehörigen Daten werden erhoben, verarbeitet und an die Projektpartner des Piloten 1 weitergeleitet.

Rechtsgrundlage der Verarbeitung personenbezogener Daten

Datenschutz-Grundverordnung der EU (DSGVO)

Art und Dauer der im Rahmen des SHAPES-Projekts durchgeführten Studie (wie lange werden die personenbezogenen Daten verarbeitet):

Einmalige Forschung

Dauer der Forschung:

SHAPES Projektlaufzeit November 2019 – Oktober 2023

Was geschieht mit den personenbezogenen Daten nach Beendigung der Studie im Rahmen des SHAPES-Projekts?

Ihre personengebundenen Daten werden nach Projektende vernichtet. Bei Abweichungen davon bedarf es einer gesonderten Einwilligung des Teilnehmers.

Datentransfer außerhalb des Forschungsregisters:

Aggregierte pseudonymisierte Daten können auch außerhalb des Projektes weitergegeben werden, beispielsweise an die WHO. Hierbei ist kein Rückschluss auf Ihre Person möglich. Rechtsgrundlage hierbei ist die Datenschutz-Grundverordnung der EU (DSGVO).

Ihre Rechte als betroffene Person

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Da Ihre personenbezogenen Daten für die im Rahmen des SHAPES-Projekts stattfindende Studie verwendet werden, werden Sie in das interne Studienregister aufgenommen. Ihre Rechte als betroffene Person sind die folgenden:

- *Recht auf Auskunft*
- *Recht auf Berichtigung*
- *Recht auf Löschung (Recht auf Vergessenwerden)*
- *Recht auf Widerruf der Einwilligung in die Verarbeitung personenbezogener Daten / Widerspruchsrecht*
- *Recht auf Einschränkung der Verarbeitung*
- *Mitteilungspflicht über die Berichtigung oder Löschung von personenbezogenen Daten oder die Einschränkung der Verarbeitung*
- *Recht auf Datenübertragbarkeit*
- *Der Betroffene kann die automatisierte Entscheidungsfindung mit seiner ausdrücklichen Zustimmung erlauben*
- *Recht auf Benachrichtigung des Datenschutzbeauftragten, wenn Sie den Verdacht haben, dass eine Organisation oder eine Person personenbezogene Daten unter Verletzung von Datenschutzbestimmungen verarbeitet / Beschwerderecht*

Sie können Ihre Rechte ausüben, indem Sie sich an den Datenverantwortlichen der Studie wenden.

Verarbeitung, für die eine Identifizierung der betroffenen Person nicht erforderlich ist

Ist für die Zwecke, für die ein Verantwortlicher personenbezogene Daten verarbeitet, die Identifizierung der betroffenen Person durch den Verantwortlichen nicht oder nicht mehr erforderlich, so ist dieser nicht verpflichtet, zur bloßen Einhaltung dieser Verordnung zusätzliche Informationen aufzubewahren, einzuholen oder zu verarbeiten, um die betroffene Person zu identifizieren.

Wenn der für die Verarbeitung Verantwortliche die betroffene Person nicht identifizieren kann, gelten die Rechte auf Auskunft, Berichtigung, Löschung, Meldepflicht und Datenübertragbarkeit nicht, es sei denn, die betroffene Person stellt zusätzliche Informationen zur Verfügung, die ihre Identifizierung ermöglichen.

Pseudonymisierung und Anonymisierung

Alle von Ihnen erhobenen Daten werden vertraulich und entsprechend den gesetzlichen Bestimmungen behandelt. Die einzelnen Teilnehmer werden mit einem Code versehen, und die Daten werden in verschlüsselter Form in den SHAPES-

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Projektdateien gespeichert. Die Ergebnisse werden analysiert und in einer kodierten, aggregierten Form präsentiert. Personen können ohne einen Codeschlüssel nicht identifiziert werden. Ein Codeschlüssel, mit dem einzelne Forschungsteilnehmer der Pilotstudie 1 und ihre Antworten identifiziert werden können, wird nur vom Pilotverantwortlichen (Carus Consilium Sachsen) und den zu Pilotstudie 1 dazugehörigen Technikpartnern gespeichert, die Daten werden nicht an Personen außerhalb dieser SHAPES-Pilotgruppe weitergegeben. Die endgültigen Forschungsergebnisse werden in aggregierter Form berichtet, und es wird unmöglich sein, einzelne Teilnehmer zu identifizieren.

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Annex 8

UC-PT1-001 Evaluation of the questionnaires phase 2 (Mock-ups)

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_8_-PT1_UC001_Evaluation-questionnaires-Mock-up.xlsx

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Annex 9

PT1 Hands-on-Training Notes

15.02.2022

Feedback on digital solutions

SHAPES App: Weather information

1) Make "city" selectable

2) Add rain radar (more useful than just weather information)

SHAPES App: Air Quality

1) When air quality is poor, an alarm should be sent to the tablet and the watch. This should vibrate, if possible, as acoustic signals can often be lost. Physical ones, however, do not.

2) Where is the sensor located? Ex: CO2 sinks downwards → useful would be the sensor "down" in the room.

Patient file

- Main data should be created in appropriate file

1) Senior file: Age, height, weight, GP, level of care.

2) Carer file: Who, contact information, address (should be quickly accessible in case of emergency).

Video telephony

1) Screen sharing
2) Voice control
3) Group consultation /chat

General notes on the solutions

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- How are seniors reminded of outstanding tasks? → Notifications suggested
- Improvement opportunity: detect fall movement and ability to call 911 (if senior does not respond) or call contacts.
- Great outrage about gendering in digital assistant (both participants).

Questions on well-being surveys (WHO).

- Physical limitations are not considered (senses only).
- Questions about death are legitimate. Varies from type to type of person and depends on individual attitude to life.
- See evaluation? Yes (both participants)

16.02.2022

Feedback on digital solutions

SHAPES App:

1) Font in the app too small

2) Symbols big enough

3) Strengthen contrasts

Smart watch

1) How large is the storage capacity of the watch? How often do you have to connect to the tablet for the data to be transferred?

2) Font is much too small

3) Can the temperature also be measured? (is part of the health status recording)

4) Include air pressure gauge (for on the go)

SHAPES App: Weather information

1) Create possibility for displaying pollen count (for allergy sufferers) & corresponding notification

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2) Record ozone levels

SHAPES App: Air Quality

1) Record air pressure

Video telephony

1) Possibility of voice control

Digital assistant

1) Observe changes in speech –> information about the health status of participants/patients

- Possibility of improvement: alarm system in case of falls
- Identification of the person at registration?
- Gendering is okay, is part of it nowadays (all three participants)

Questions about surveys on well-being (WHO)

- Nonsense and nonsensical
- Strange questions
- Much too general
- Every 14 days is too frequent
- Questions about death are undesirable/unpleasant to answer
- Lack of background information on the patient, therefore no correct conclusions can be drawn from the results
- Where is the connection with the project?
- There are more important questions, e.g. "Do you need help with domestic chores?", "Do you need help to go out?"

17.02.2022

Feedback on digital solutions

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Smart Watch

1) Additional security would be nice (additional loop or two holders)

2) Nice design

3) Contrasts are good

SHAPES App

1) When are steps active steps? Are there thresholds for this?

SHAPES App: Weather information

- helpful because it's all in one app and you don't have to use your smartphone to get it.

SHAPES App: Air Quality

- no suggestions so far

Tablet: font and screen sometimes not responsive

Digital assistant

1) "you" form not nice, does not feel comfortable with it

2) Gendering unnecessary

Questions on well-being surveys (WHO)

- Clear, easy to read
- Questions are upsetting, make people sad (e.g. love / loneliness)
- See evaluation - how many people are in the same situation? (a bit reassuring)

22.02.2022

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Feedback on digital solutions

- Font too small
- Font on the clock too small
- Axis labelling too small
- Switching off devices via the app
- Weather for allergy sufferers
- Digital assistant: "you" form ok (1x), prefer "you" form (1x)

Questions on surveys about well-being (WHO)

- Be able to select surveys (no slider)
- Handling ok
- Questions partly strange

23.02.2022

Feedback on digital solutions

SHAPES App

- Font too small
- Colour coding of heart rate (green = good, red = critical range)

Sleep:

- 1) when was sleep good or bad (form percentage / score where several factors are included → bspw. alcohol, greasy food
- 2) take snoring into account

SHAPES App: Weather information

- Weather in correlation to other values?

SHAPES App: Air Quality

- Carbon monoxide sensor for air quality (for fireplace, for example)
- Pre-warning levels for air quality (before setting off the alarm)

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Appliance monitoring:

1) Switch devices on and off (possible with AVM plug)

2) Form "groups

Video telephony

- Video telephony: share / provide documents (doctors etc.)

Digital Assistant:

1) "you" form is okay,

2) Gendering is bullshit (as simple as possible, accessible)

Questions on well-being surveys (WHO)

- Handling is good
- Understandable
- Evaluation very important → Improvement of well-being over time is interesting

24.02.2022

Feedback on digital solutions

SHAPES App

- Font too small (app & clock)
- "Quality of life" instead of "well-being"
- "Survey on well-being / quality of life" change
- Sleep analysis: temperature measurement is part of it

SHAPES App: Weather information

- Allergic / asthmatic weather

SHAPES App: Air Quality

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- Air quality: consider underfloor heating

Questions on well-being surveys (WHO)

- Questions about death not fortnightly ("try not to think about it")

Evaluation:

1) comparison with others could be an incentive to become fitter

2) Hints in the sense of "take care of a doctor's appointment".

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Annex 10

UC-PT1-001 Evaluation of the questionnaires phase 3 (Hands-on-sessions)

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_10__PT1_UC001_Evaluation-questionnaires-Hands-on.xlsx

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Annex 11

UC-PT1-001 User manua

Leitfaden

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1. Vorwort

Liebe Projektteilnehmer,

wir freuen uns, dass Sie Teil unseres sächsischen Piloten im Projekt SHAPES sind und mit uns gemeinsam die Lösungen unserer technischen Partner aus Europa für eine intelligente Wohnumgebung testen möchten. Sie leisten damit einen wichtigen Beitrag zur europaweiten Gesundheitsforschung.

Sie haben uns schon über mehrere Phasen im SHAPES Projekt begleitet und sind von Anfang an in die Entwicklung der Geräte involviert. Dafür sind wir Ihnen sehr dankbar. Nun befinden wir uns in der letzten Phase, in der Testung der Prototypen.

Zielstellung der Testphase ist es, die Geräte auf Funktionsfähigkeit und Nutzerfreundlichkeit zu testen. Zudem möchten wir gern mehr von Ihnen zur Handhabbarkeit, Übersichtlichkeit und zum Design der Shapes CCS App erfahren.

Zu diesem Zweck wäre es schön, wenn Sie je nach persönlichen Möglichkeiten täglich die Anwendungen nutzen, testen und anschauen. Dabei sind diese Daten relevant:

- Schritte
- Schlaf
- Puls
- Wetter
- Luftqualität
- Geräteüberwachung
- Befragung

Um Ihnen die Dokumentation während der Testphase zu erleichtern, haben wir für Sie ein Tagebuch vorbereitet. Am Ende der Testphase möchten wir zudem mit Ihnen ein Interview durchführen.

Um Ihnen eine Übersicht über die Funktionsweise der verschiedenen Geräte zu geben, haben wir für Sie diesen Leitfaden entwickelt. Am Ende des Leitfadens finden Sie unsere Kontaktdaten, sollten Sie weitere Fragen haben oder Hilfe benötigen.

Wir wünschen Ihnen viel Spaß beim Testen!

Herzliche Grüße,

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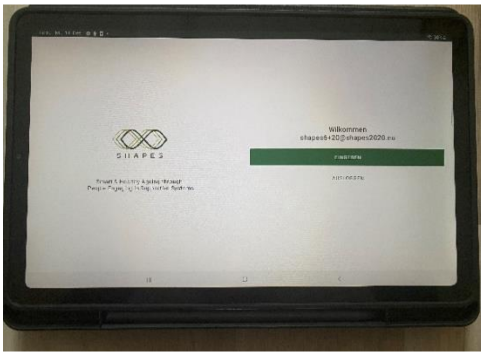
2. Checkliste Geräte

1x Tablet inklusive Ladekabel



1x Fitness Armband inklusive Ladekabel

2x Smart Socket (Intelligente Steckdose)

1x Luftqualitätsmesser

1x Gateway + LAN Kabel

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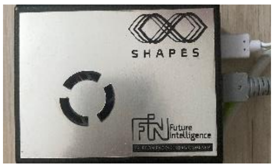
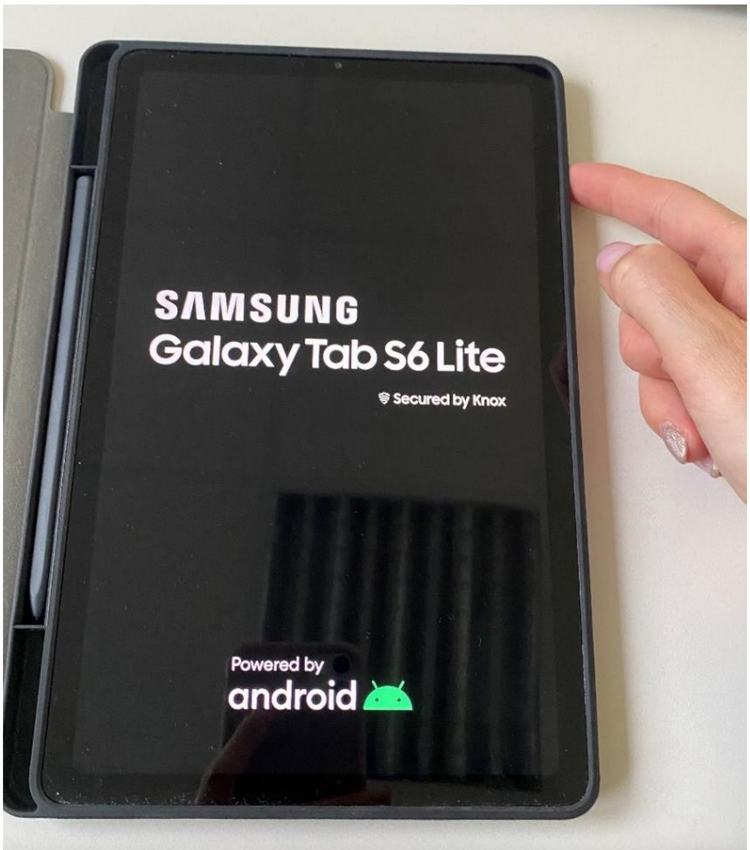


3. Tablet

3.1 Einschalten/Ausschalten

Halten Sie den schwarzen Knopf am rechten Rand des Tablets für mehrere Sekunden gedrückt.



Das Gerät wird nun gestartet und Sie gelangen nach einiger Zeit zum Sperrbildschirm:

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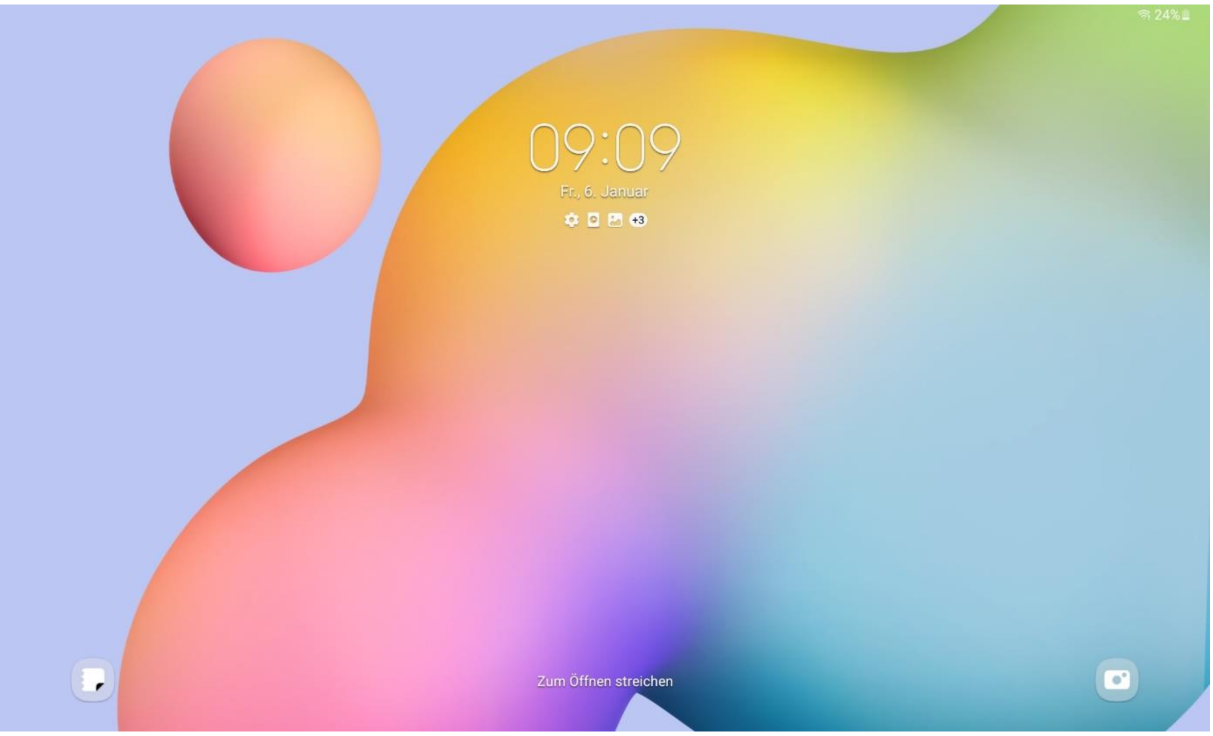
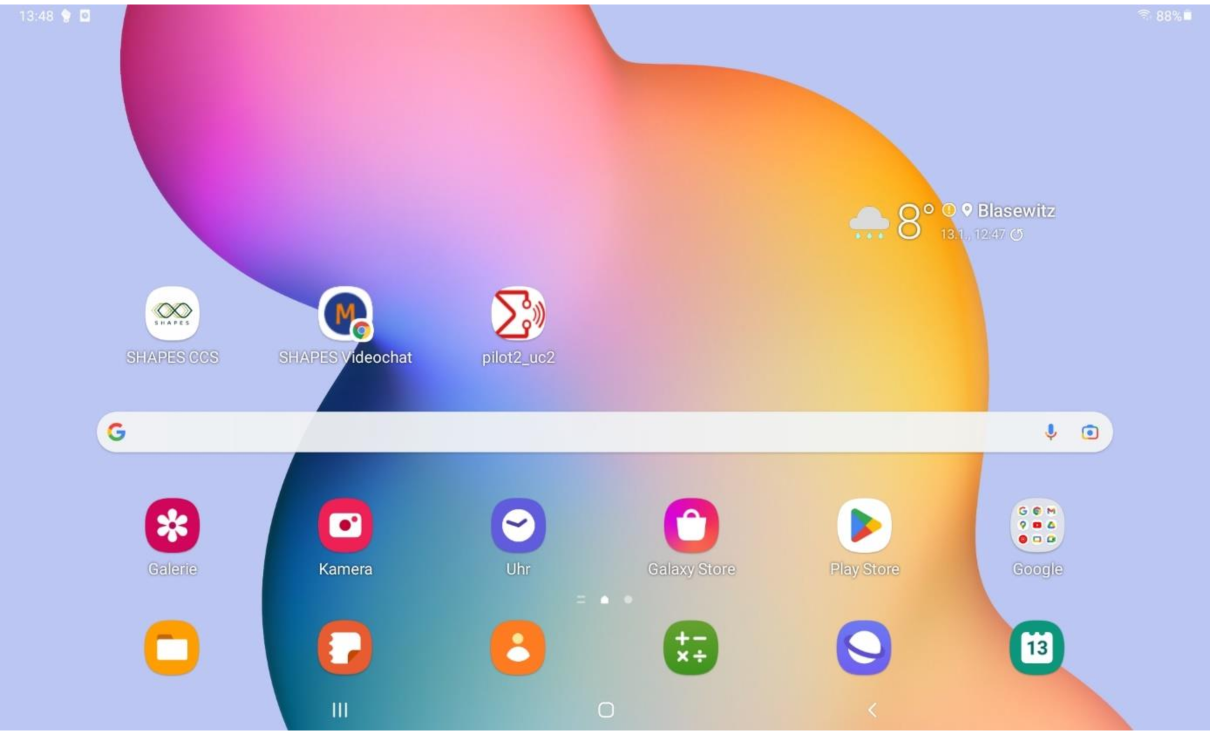


Streichen Sie über den Bildschirm, um zum Startbildschirm zu gelangen. Ist der Bildschirm des Tablets zwischendurch wieder „schwarz“ geworden, tippen Sie kurz auf den An-/Aus-Knopf am rechten Rand. Nun können Sie die einzelnen Anwendungen sehen, die sich auf dem Tablet befinden.



3.2 Bedienen

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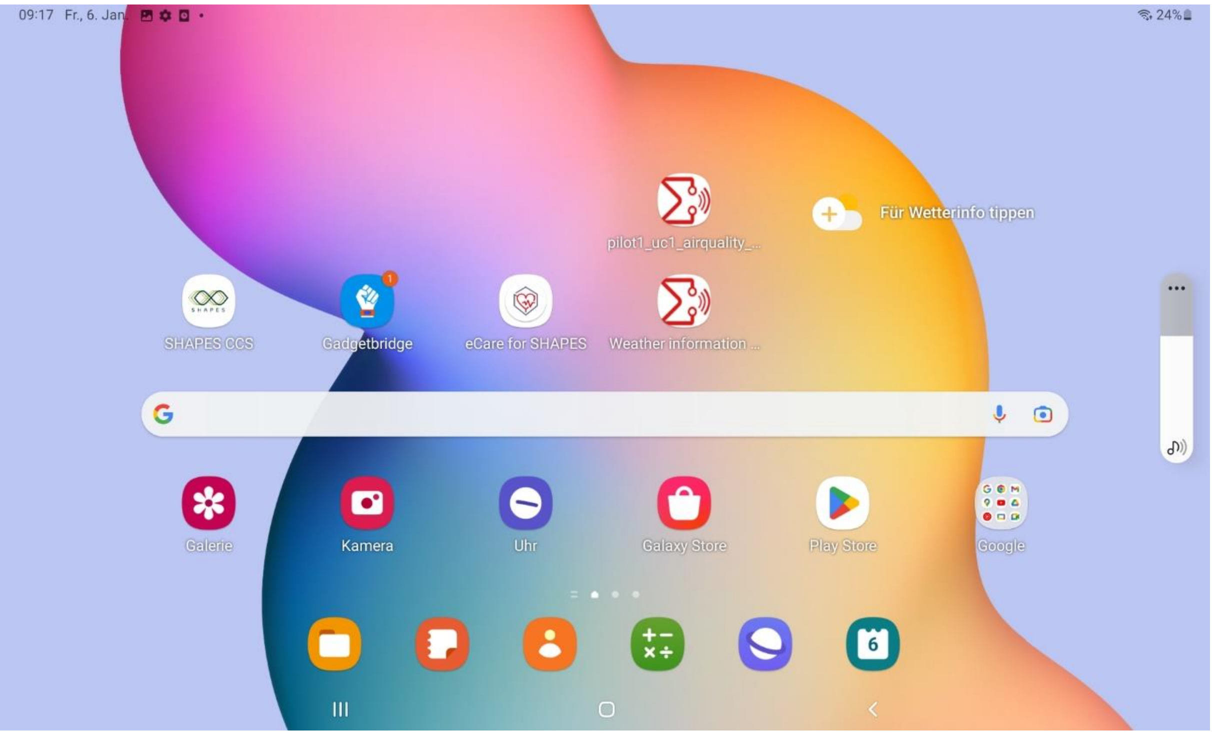
Durch die Touch-Funktion lässt sich das Tablet bedienen. Sie können dazu Ihren Finger benutzen oder den dazugehörigen Stift am Tablet. Um den Sperrbildschirm einzuschalten, tippen Sie kurz auf den An-/Ausschaltknopf.

Haben Sie eine Anwendung geöffnet und möchten zurück zum Hauptmenü, tippen Sie auf den viereckigen Knopf in der Mitte des Tablet (siehe Bild oben).

3.3 Lautstärke einstellen

Am rechten Rand des Tablets unterhalb des Ein- und Ausschaltknopfes befindet sich die Regelung für die Lautstärke. Drücken Sie den oberen Teil des Knopfes, um lauter zu stellen oder den unteren Teil um leiser zu stellen. Ihnen wird zeitgleich rechts auf dem Display ein Lautsprecher angezeigt und eine Skala.



3.4 Im Internet surfen

Tippen Sie auf das Symbol „Google“ (siehe Kreis). Anschließend öffnet sich das Fenster wie im nachfolgenden Bild. Tippen Sie auf „Chrome“.

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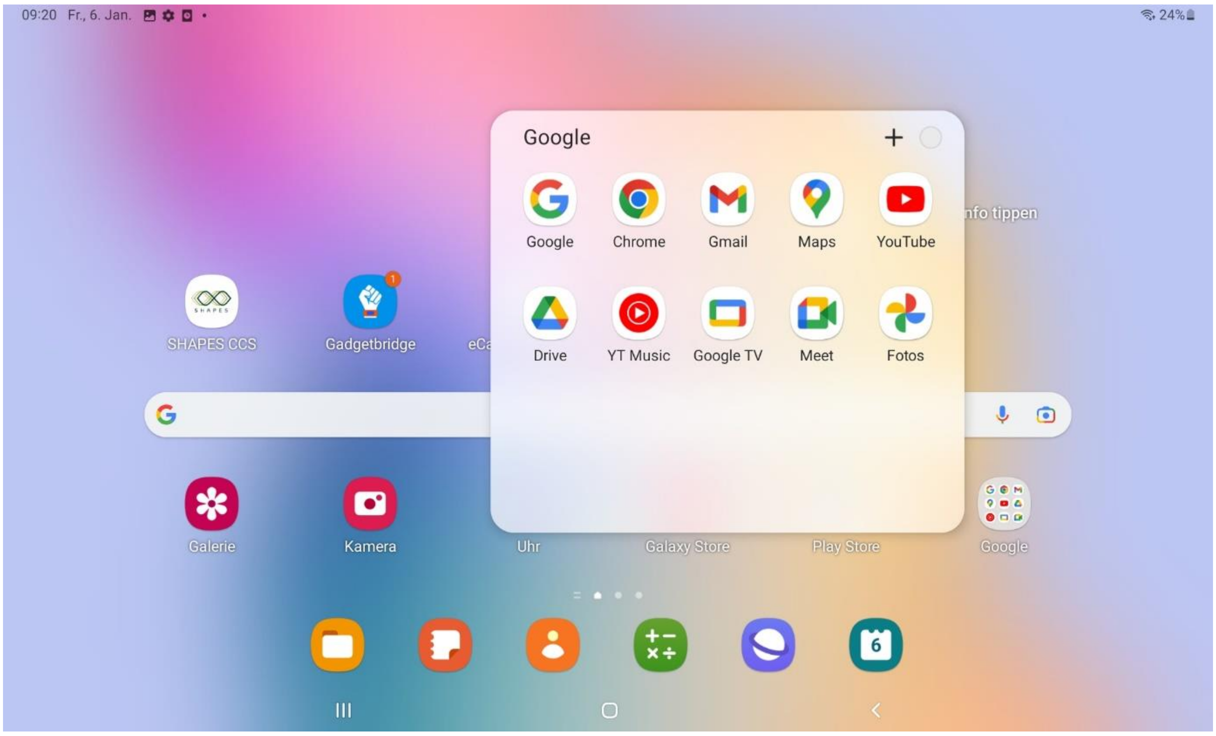
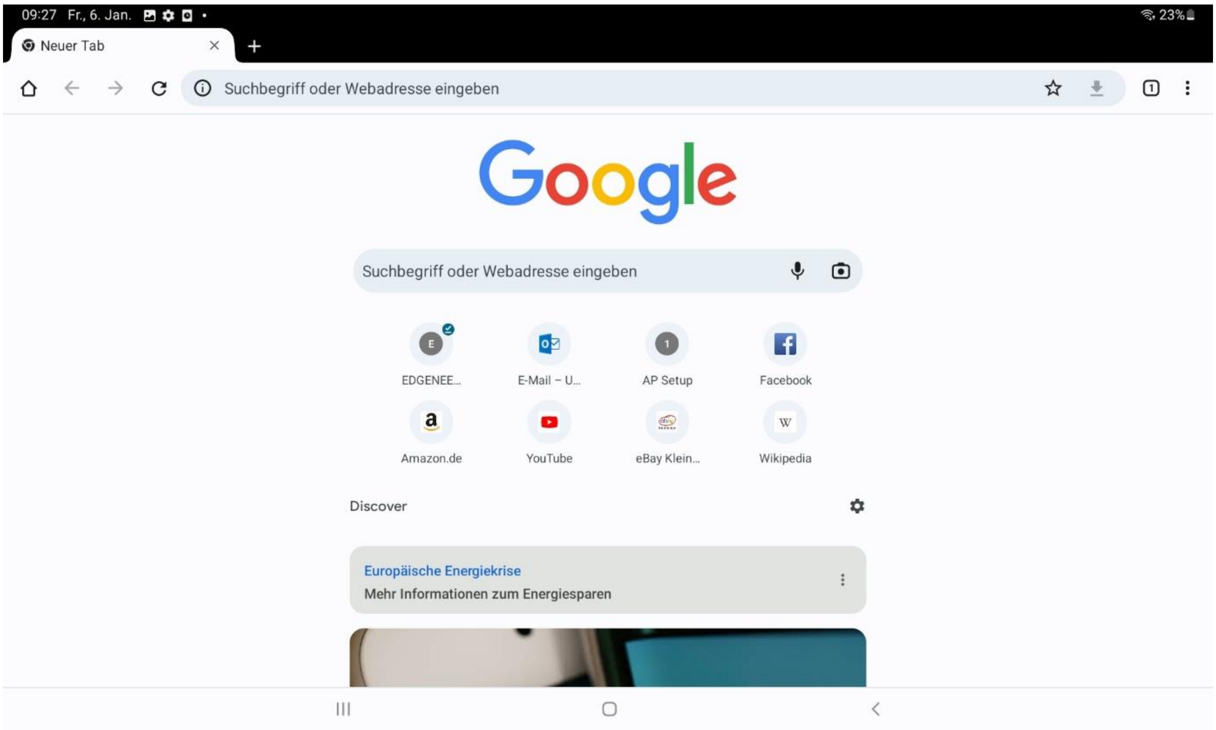
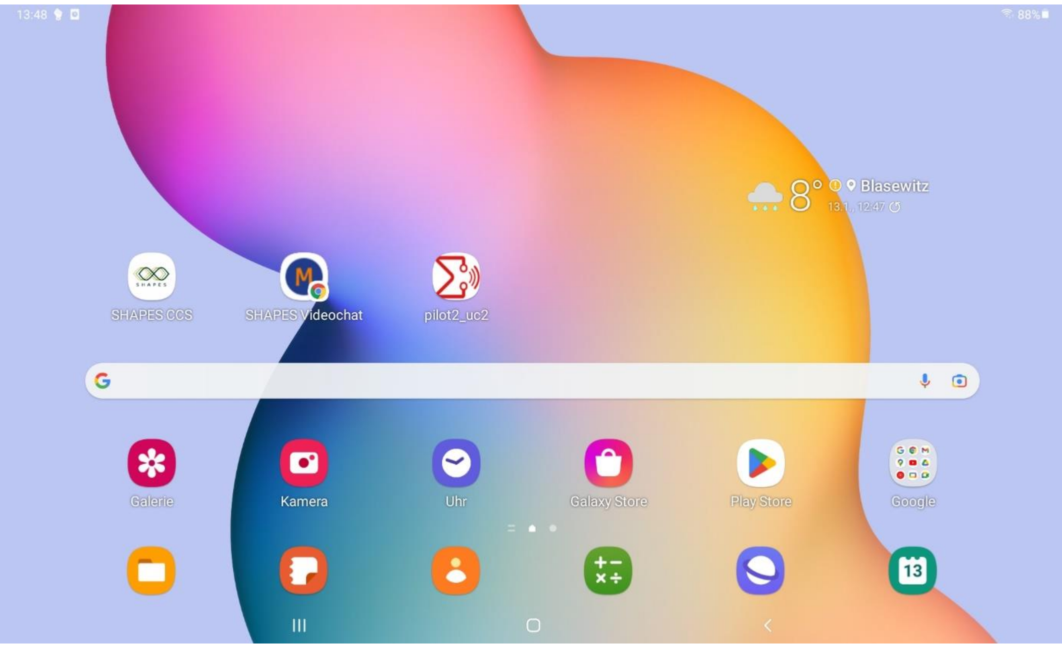


Anschließend öffnet sich der Internetbrowser und Sie können Ihre gewünschte www.Adressse.de oder einen Suchbegriff eingeben.



Tippen Sie auf das viereckige Symbol in der Mitte, um zurück zum Startbildschirm zu gelangen.

3.5 Übersicht SHAPES Anwendungen

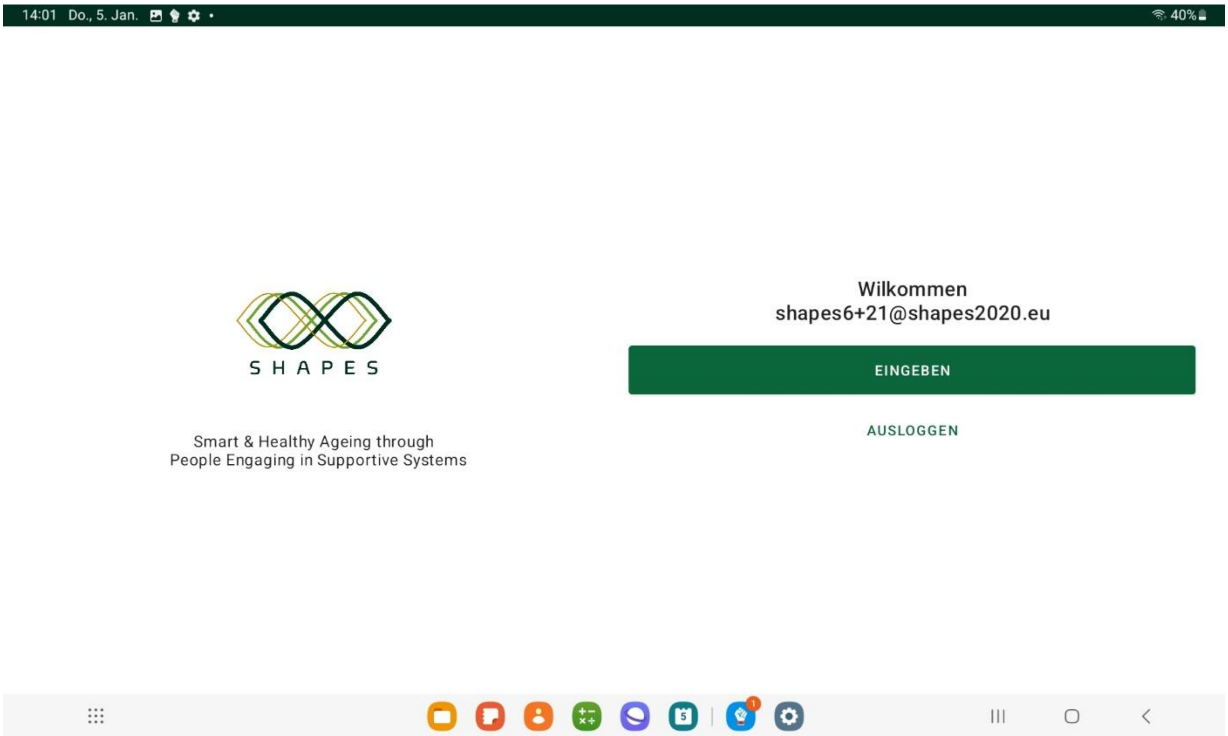


Die Anwendungen, die Sie im großen Kreis sehen sind Anwendungen, die unmittelbar mit der SHAPES APP zusammenhängen. Die SHAPES CCS App im kleinen Kreis ist die Anwendung, die für die Testphase relevant ist.

4. Login SHAPES CCS

Öffnen Sie die Anwendung „SHAPES CCS“ auf Ihrem Tablet auf der Startseite.

Klicken Sie auf das grüne Feld „Eingeben“.



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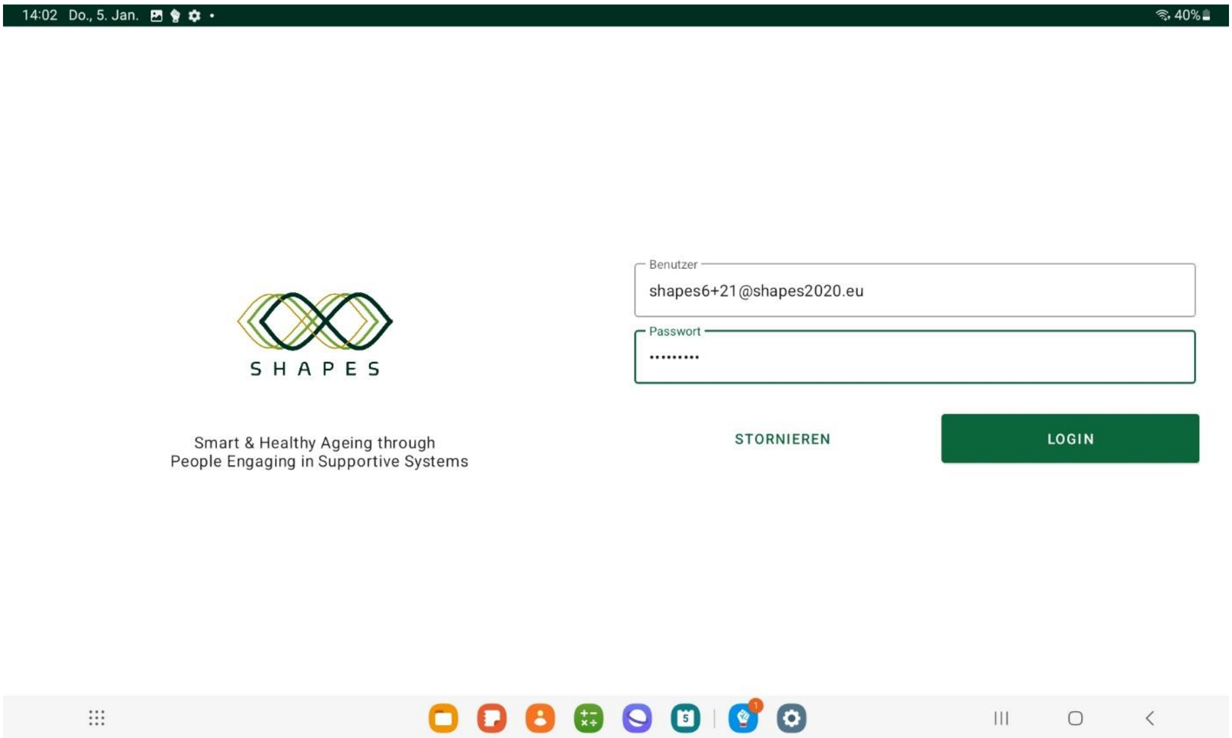
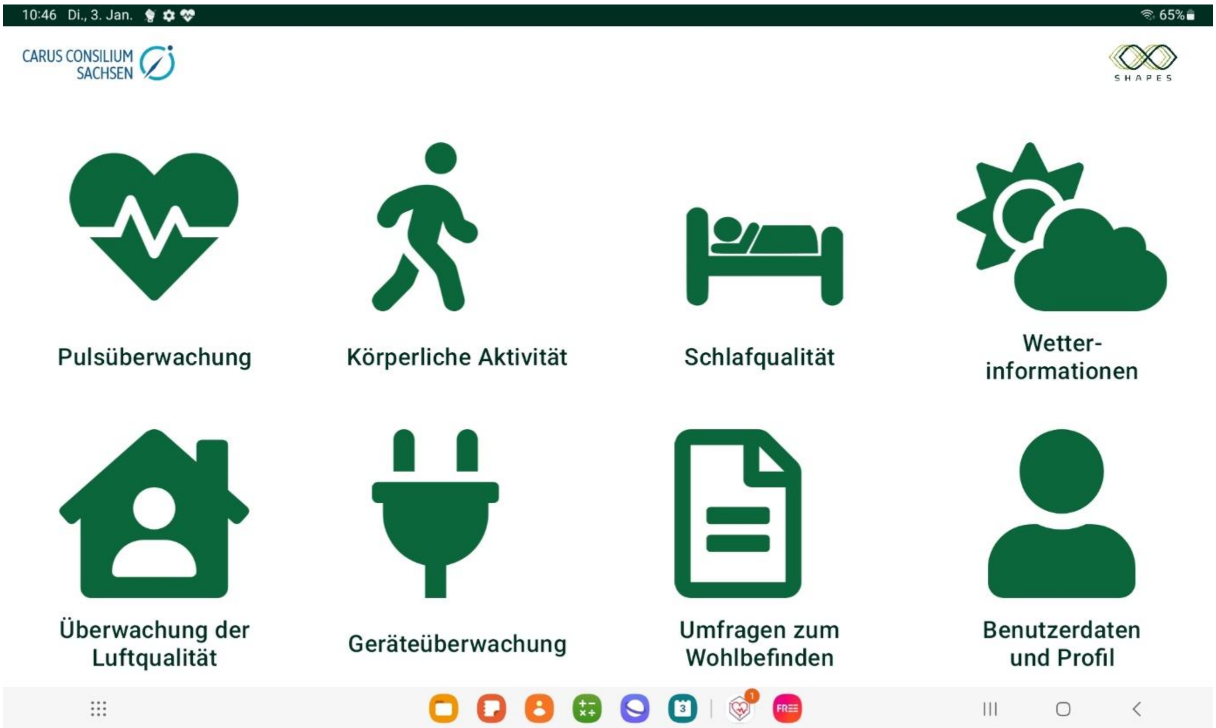
Geben Sie nun Ihren Benutzernamen und Ihr Passwort ein:

Benutzername: **Passwort:**

Klicken Sie anschließend auf das grüne „Login“- Feld.



Sie gelangen im Anschluss zur Startseite der SHAPES CCS App. Sie sehen nun die einzelnen Funktionsbereiche:



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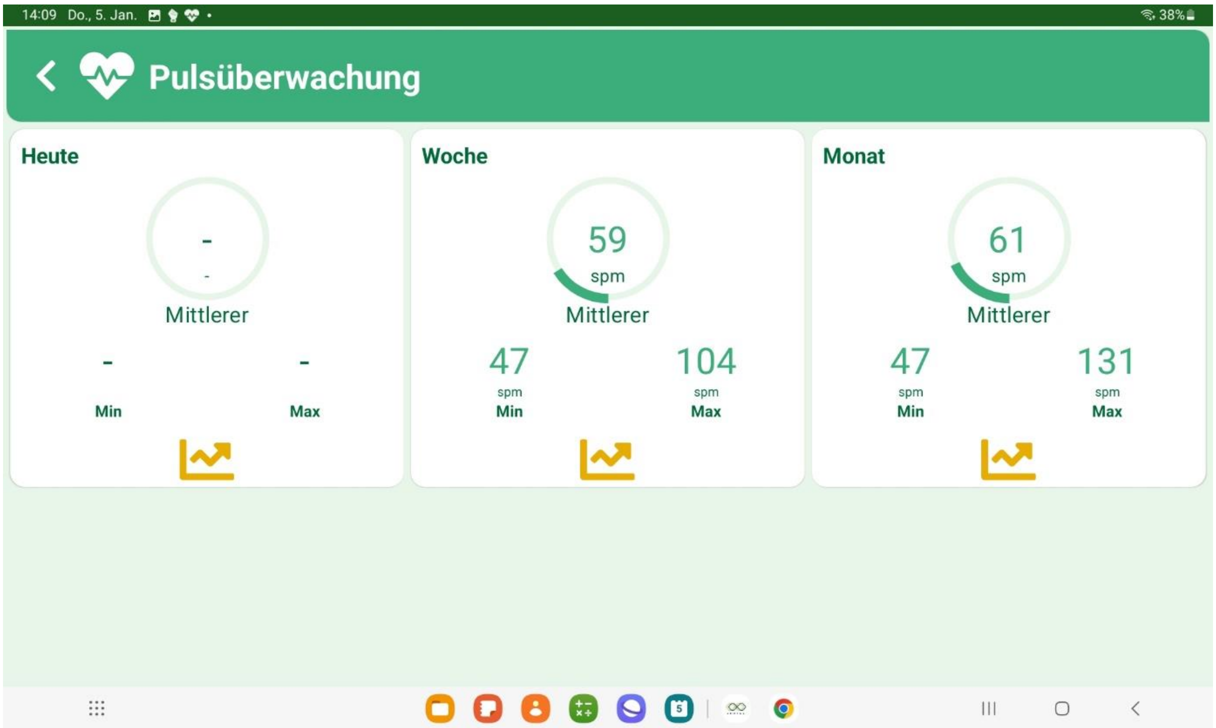
4.1 Pulsüberwachung

Klicken Sie auf das Symbol Pulsüberwachung. Sie gelangen zu folgender Übersicht:



Sie können Ihren mittleren Puls je Tag, je Woche, je Monat ansehen.

Klicken Sie auf das gelbe Grafen-Symbol um sich die Statistik anzuschauen:

Wenn Sie zurück zur Übersicht möchten, klicken Sie auf den Pfeil oben links.

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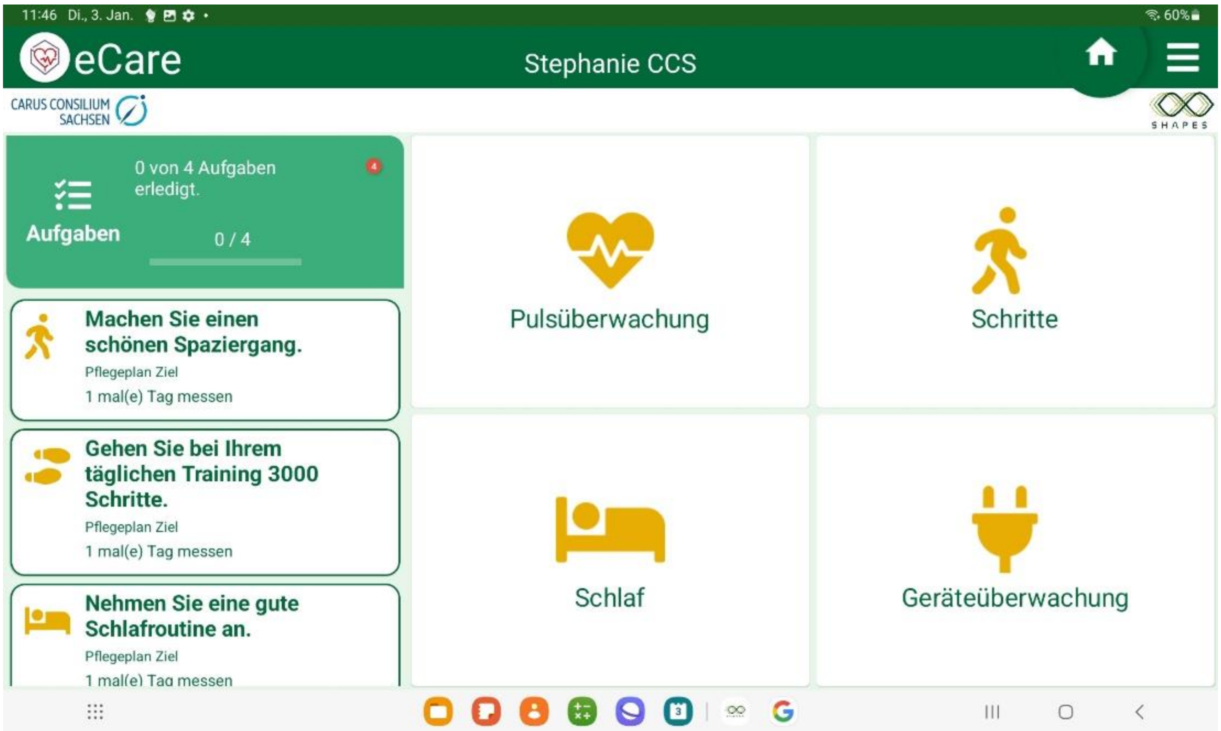

Anschließend klicken Sie auf das Haussymbol oben rechts.

Aufgaben

Hier können Sie Ihre täglichen Aufgaben sehen. Klicken Sie eine Aufgabe an und klicken Sie bei Ausführung auf „Gemacht!“. Anschließend wird die Aufgabe mit einem grünen Haken als erledigt angezeigt.

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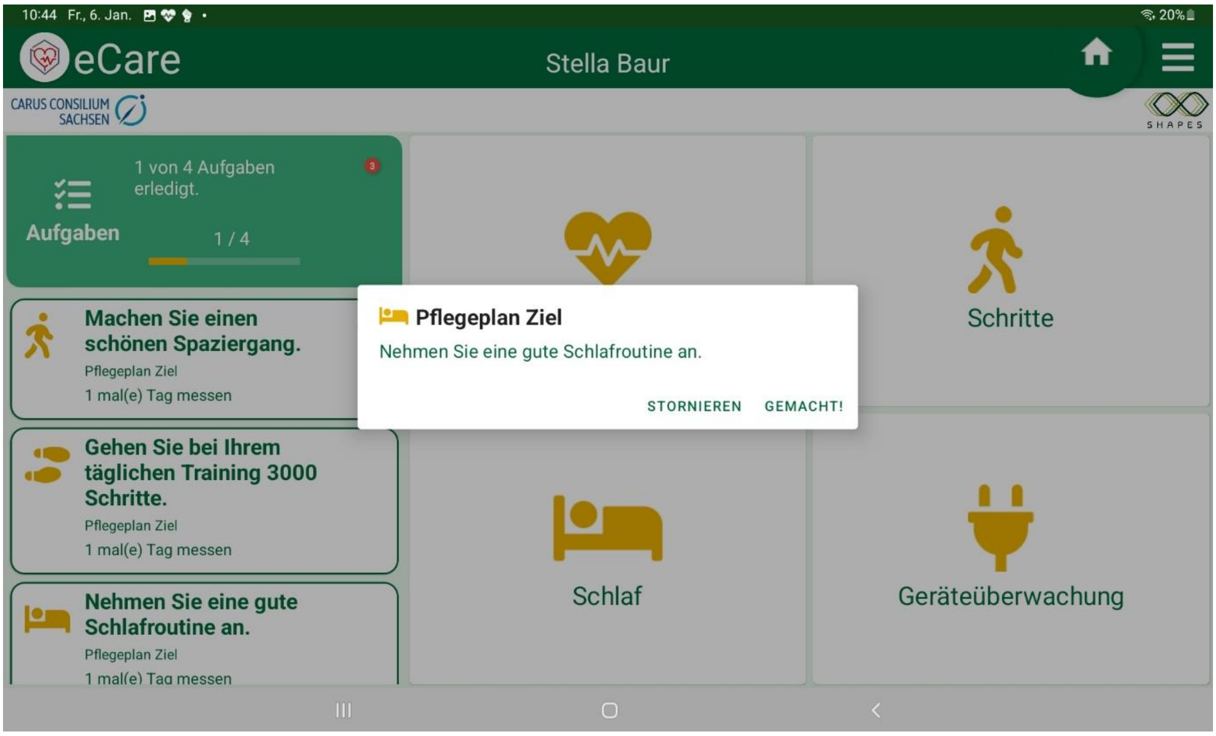
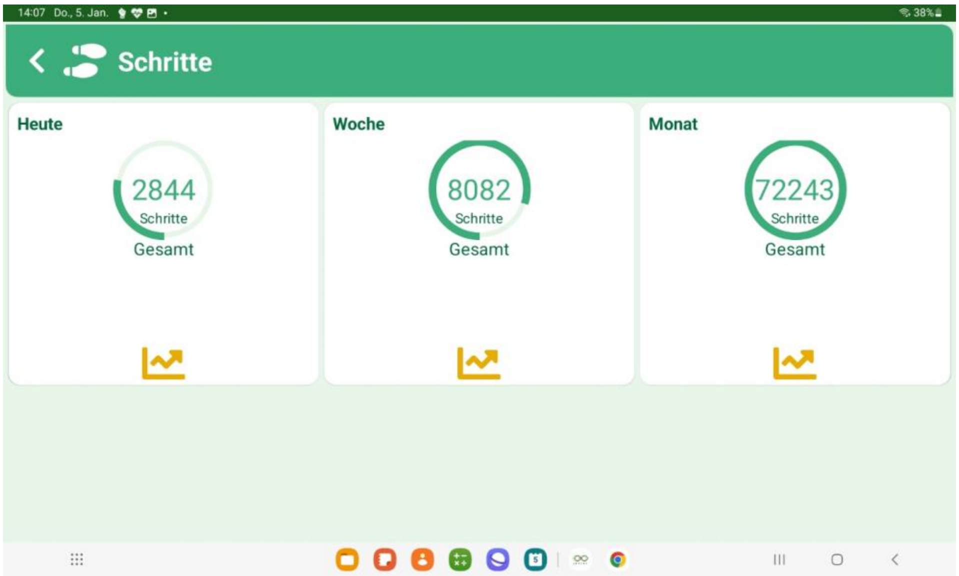


4.2 Körperliche Aktivität

Klicken Sie auf das Symbol Körperliche Aktivität. Sie gelangen zu folgender Übersicht:



Sie können sich Ihre Schritte je Tag, je Woche und je Monat ansehen. Klicken Sie auf das gelbe Grafen-Symbol, um sich die Statistik anzuschauen:

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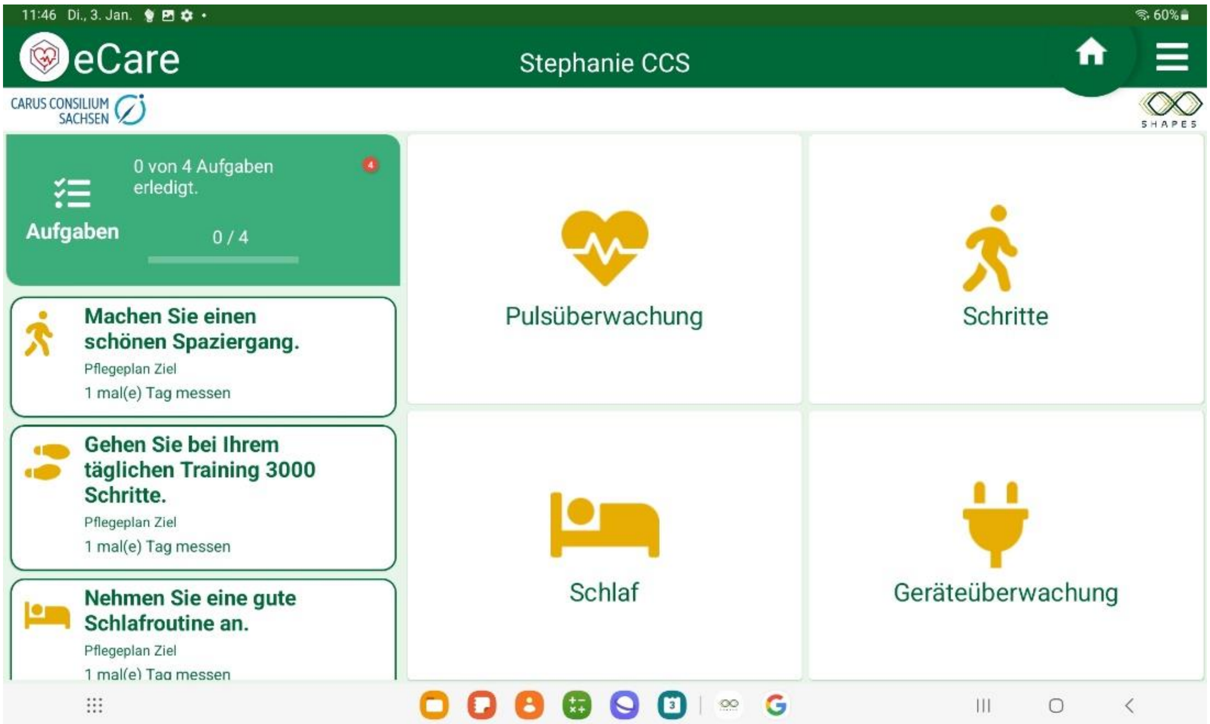
Wenn Sie zurück zur Übersicht möchten, klicken Sie auf den Pfeil oben links.

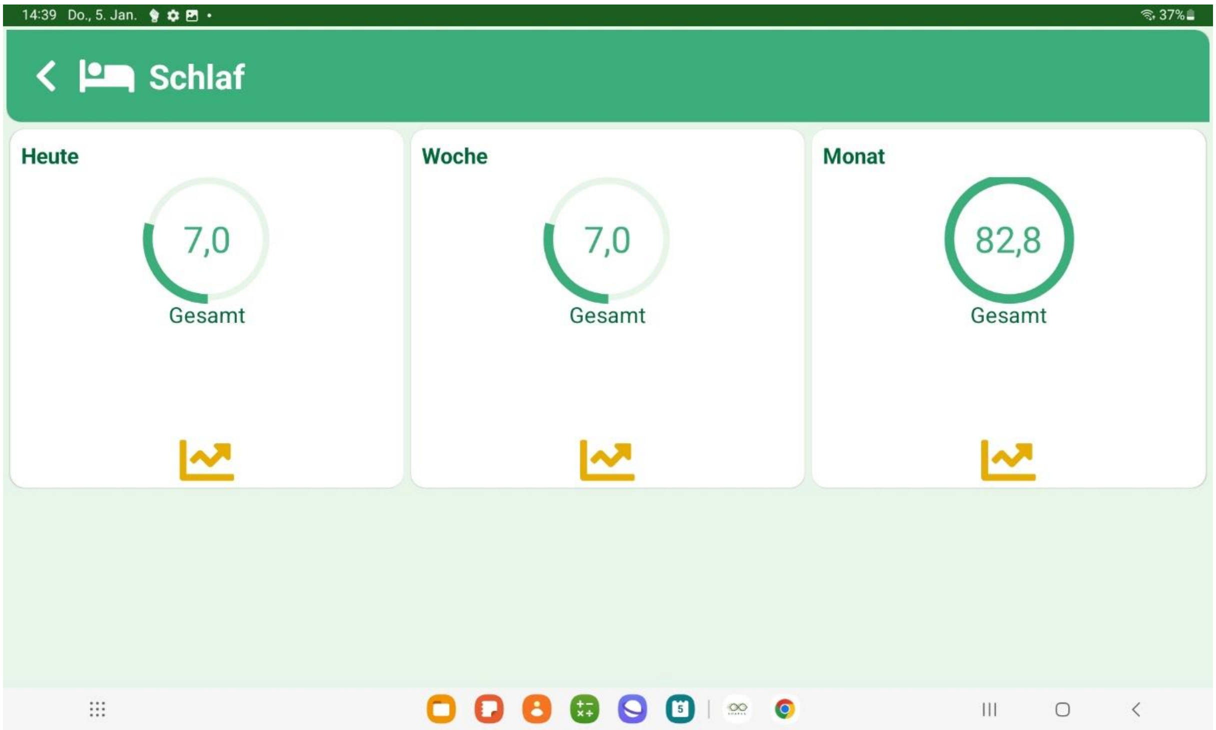


Anschließend klicken Sie auf das Haussymbol oben rechts.

4.3 Schlafqualität

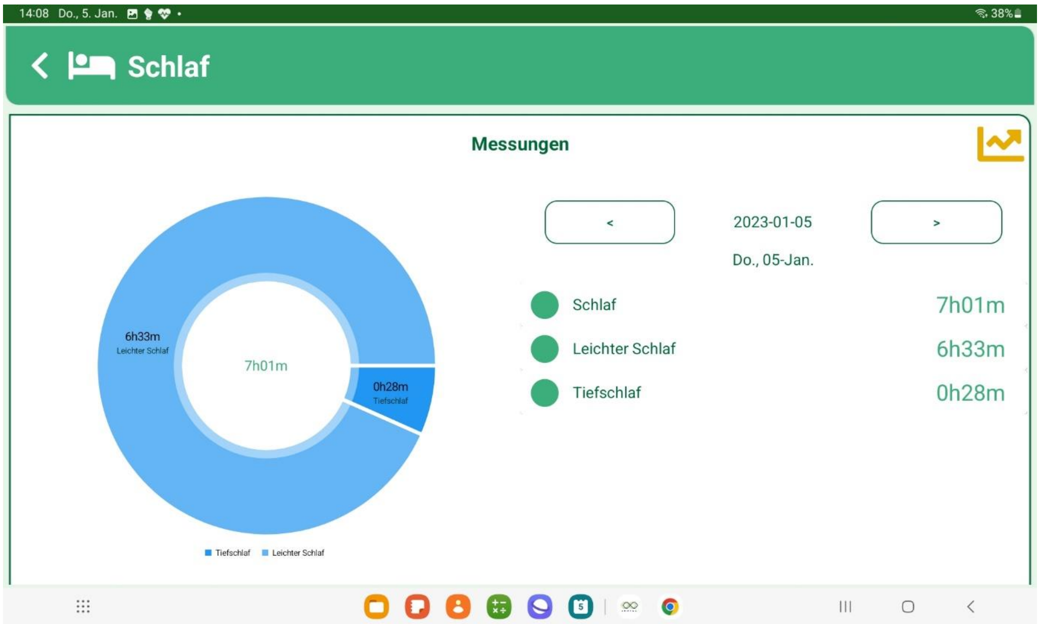
Klicken Sie auf das Symbol Schlafqualität. Sie gelangen zu folgender Übersicht:

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

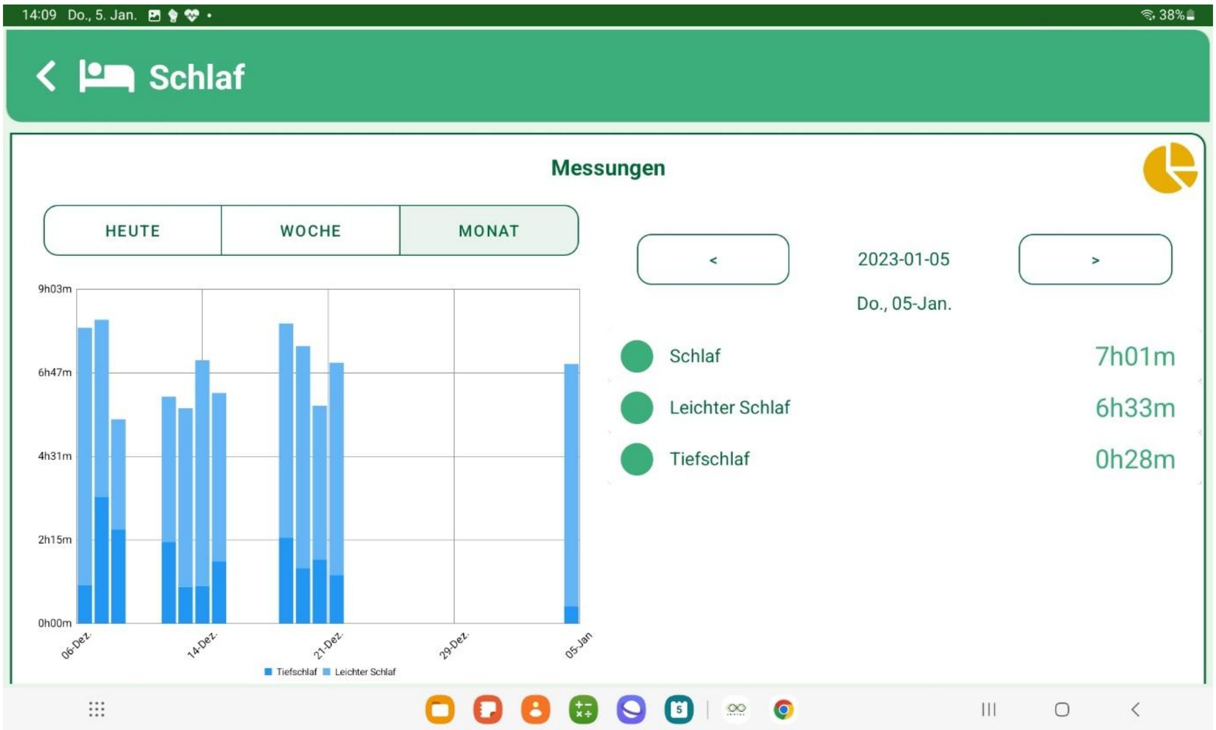


Sie können sich den Schlaf je Tag, je Woche und je Monat ansehen.

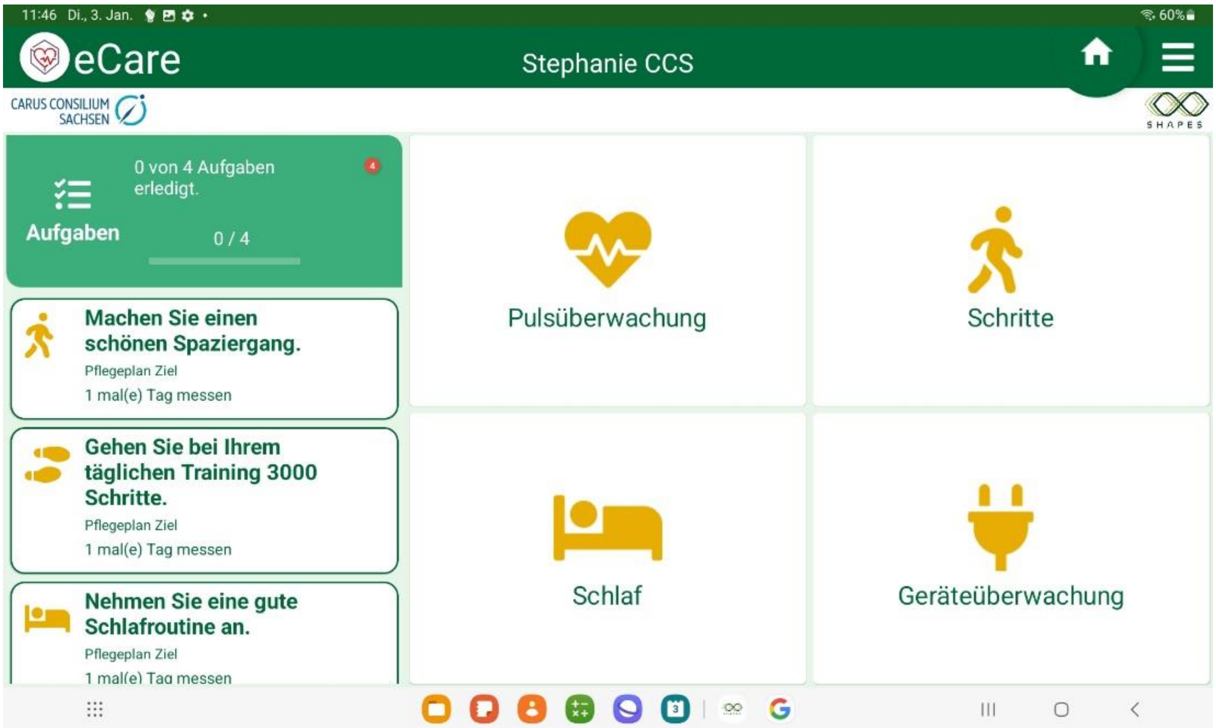
Klicken Sie auf das gelbe Grafen-Symbol, um sich die Statistik anzuschauen:



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159



Wenn Sie zurück zur Übersicht möchten, klicken Sie auf den Pfeil oben links.

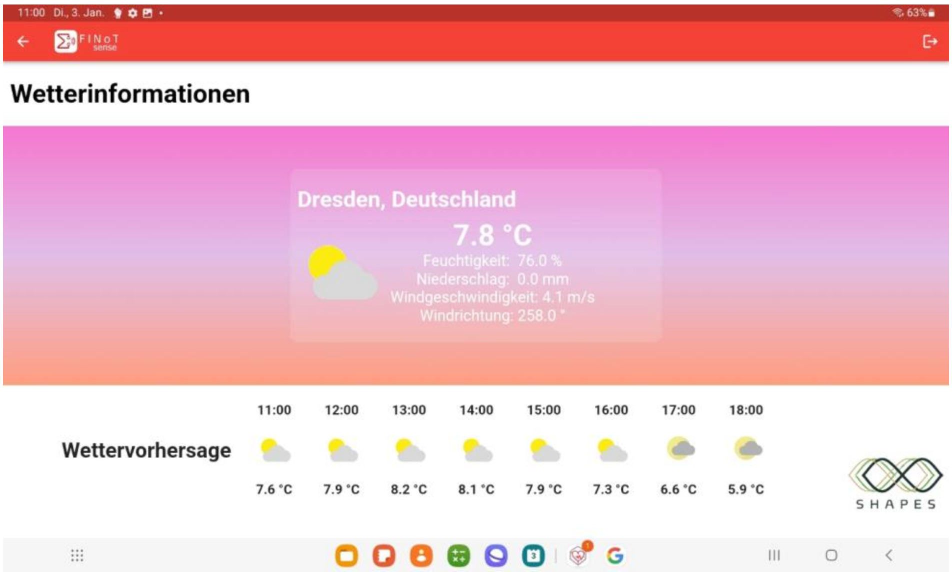


Anschließend klicken Sie auf das Haussymbol oben rechts.

4.4 Wetterinformationen

Klicken Sie auf das Symbol Wetterinformationen. Sie gelangen zur Wetterübersicht:

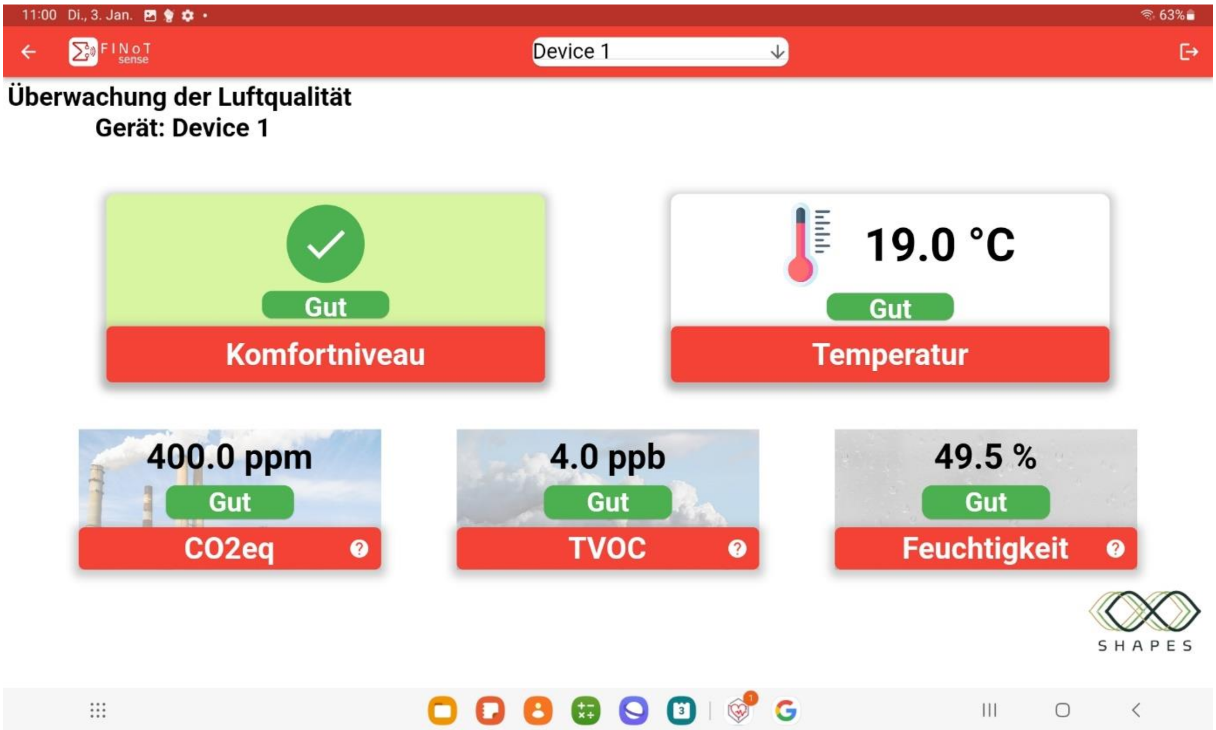
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159



Weitere Funktionen sind nicht möglich. Wenn Sie zurück zur Übersicht möchten, klicken Sie auf den Pfeil oben links.

4.5 Überwachung der Luftqualität

Klicken Sie auf das Symbol Überwachung der Luftqualität. Sie gelangen zu folgender Übersicht:



Tippen Sie auf die Kästchen (z.B. TVOC), um die Beschreibung zu einen bestimmten Wert anzusehen. Schließen Sie das Fenster, durch einen Klick auf „x“. Wenn Sie zurück zur Übersicht möchten, klicken Sie auf den Pfeil oben links.

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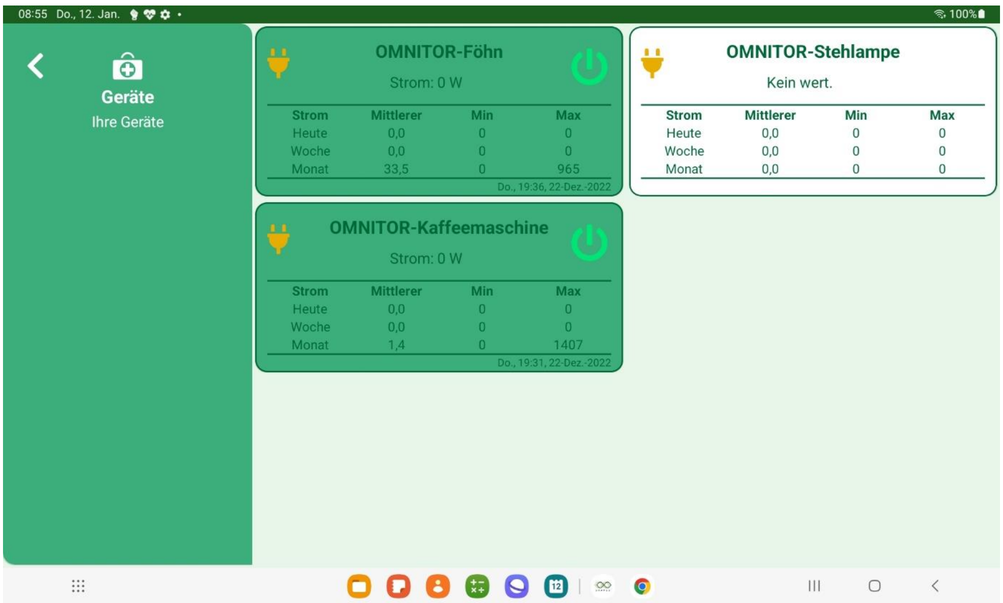
4.6 Geräteüberwachung

Klicken Sie auf das Symbol Geräteüberwachung. Sie gelangen zu folgender Übersicht:

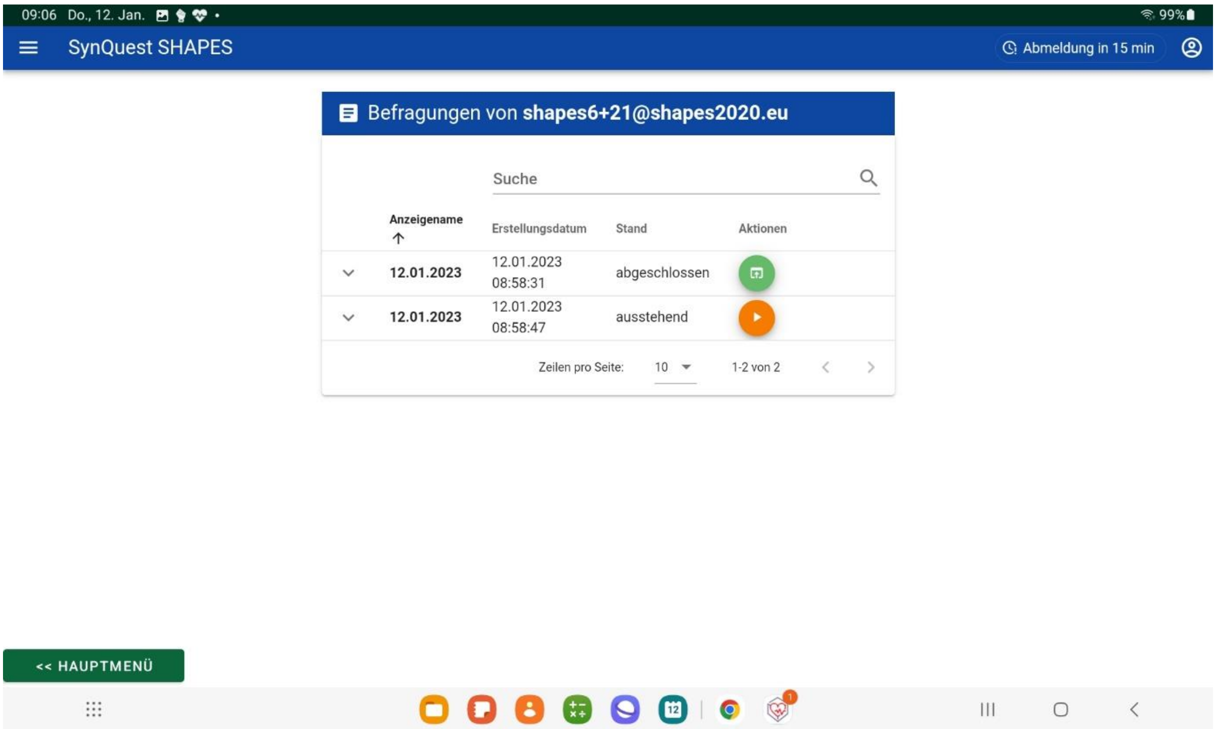


Sie können für Ihre überwachten Geräte den Stromverbrauch ansehen. Weitere Funktionen sind nicht möglich. Wenn Sie zurück zur Übersicht möchten, klicken Sie auf den Pfeil oben links.

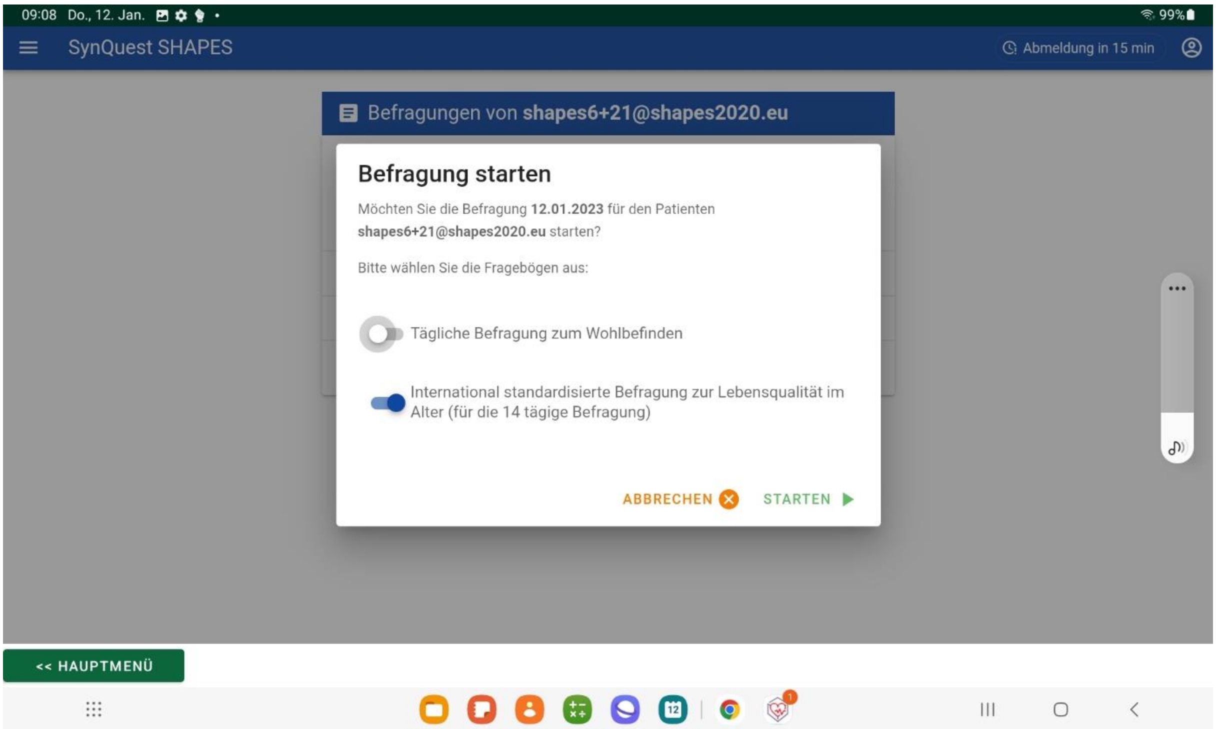
4.7 Umfragen zum Wohlbefinden

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

Klicken Sie auf das Symbol Umfrage zum Wohlbefinden. Sie gelangen zu folgender Übersicht:



Sie sehen Ihre tagesaktuelle Befragung. Diese können Sie nun durch Anklicken des orangenen Symbols starten. Drücken Sie anschließend erneut auf „Starten“:



Durch Anklicken des orangenen Symbols rechts, werden Sie durch die Befragung geführt. Wählen Sie das jeweils zutreffende aus.

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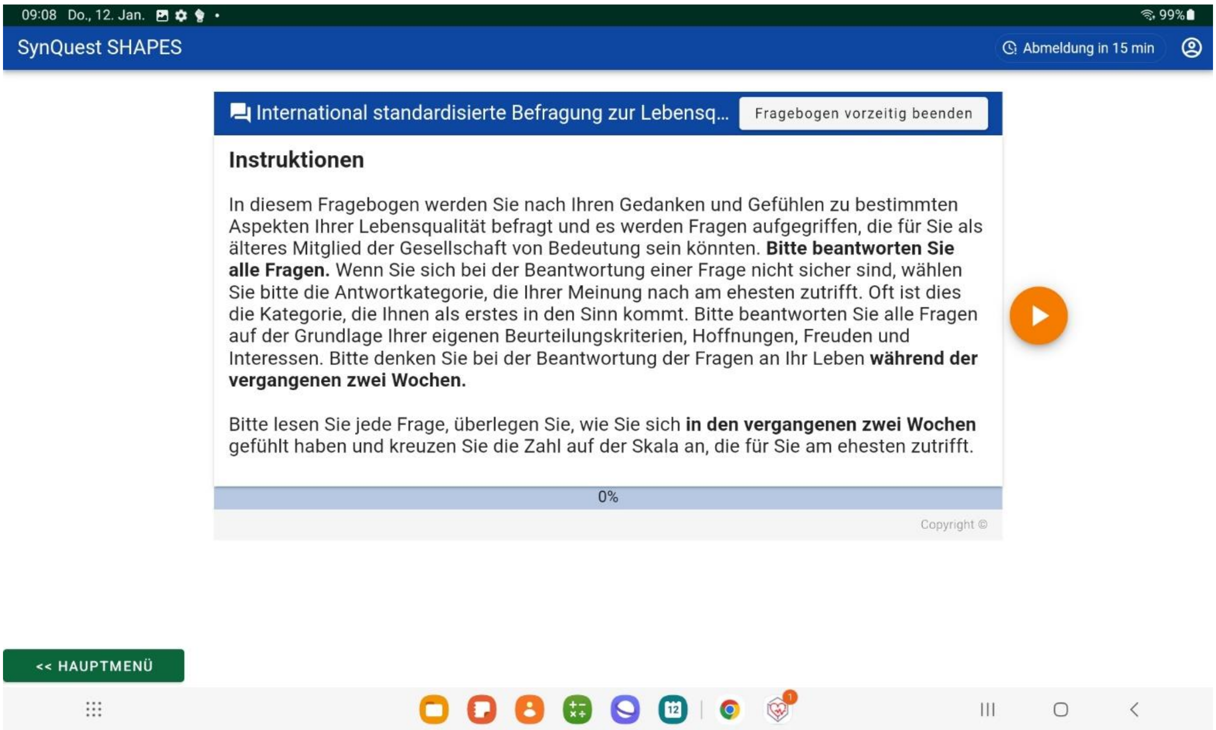
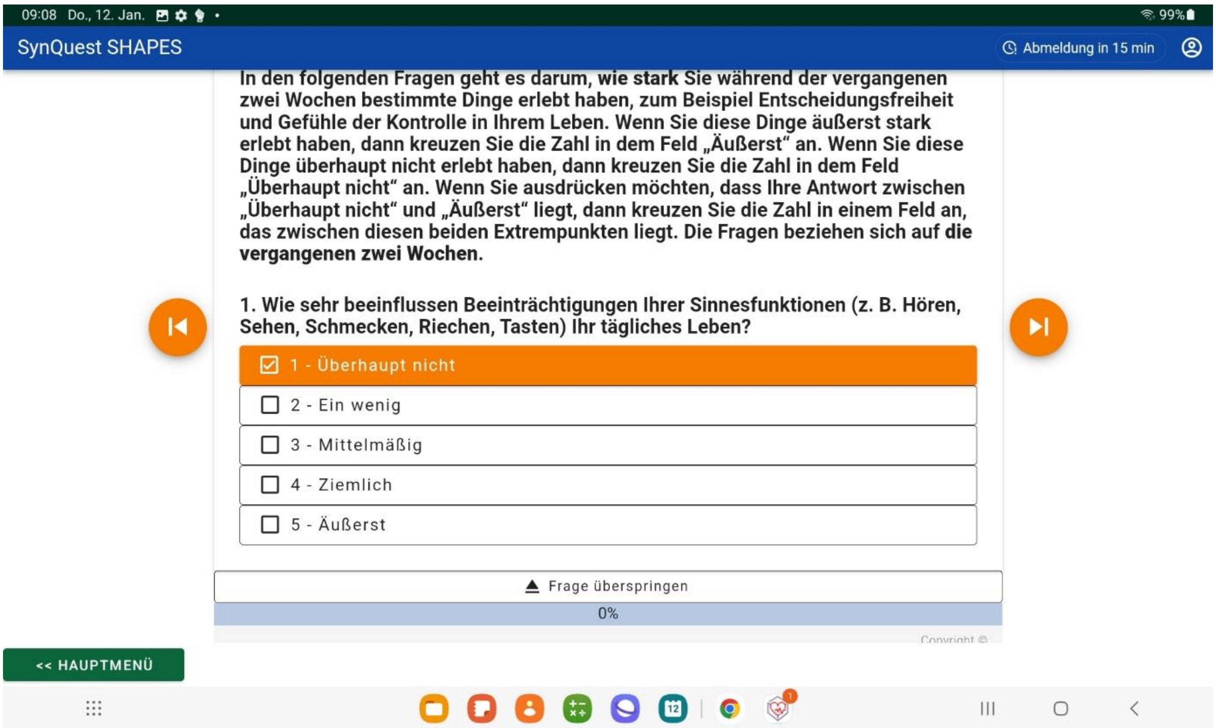
14-tägige-Befragung:





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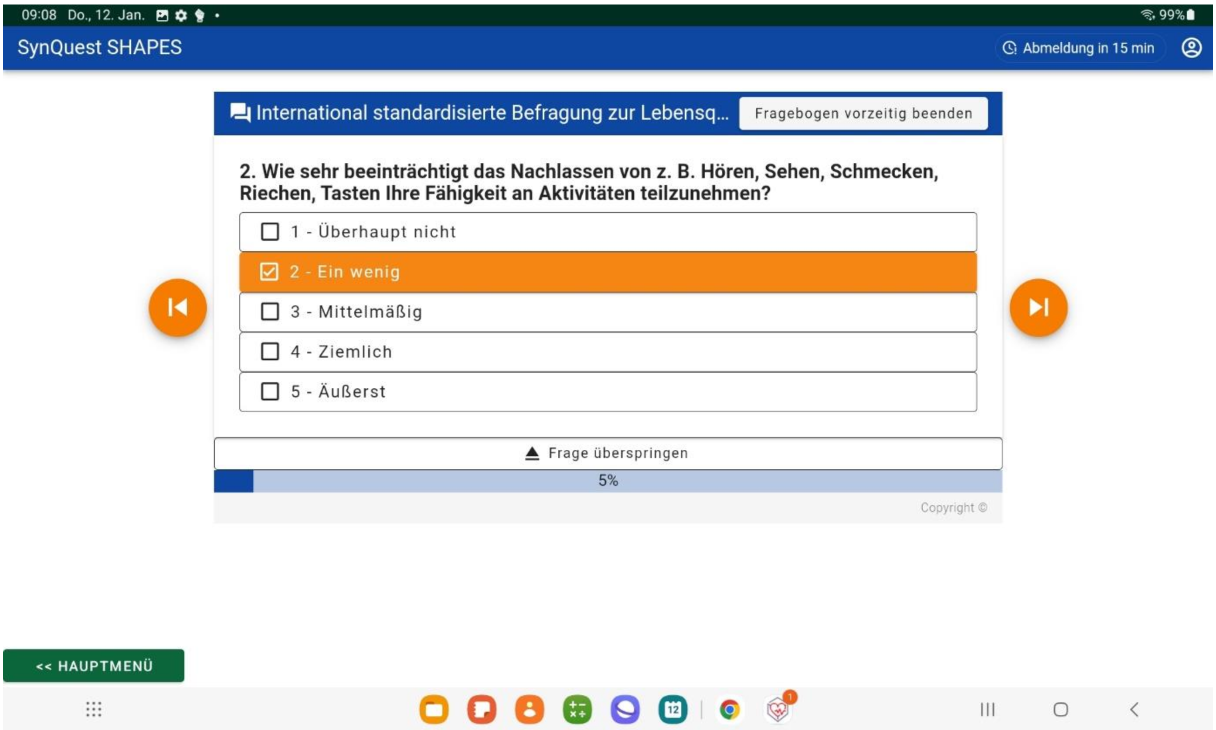
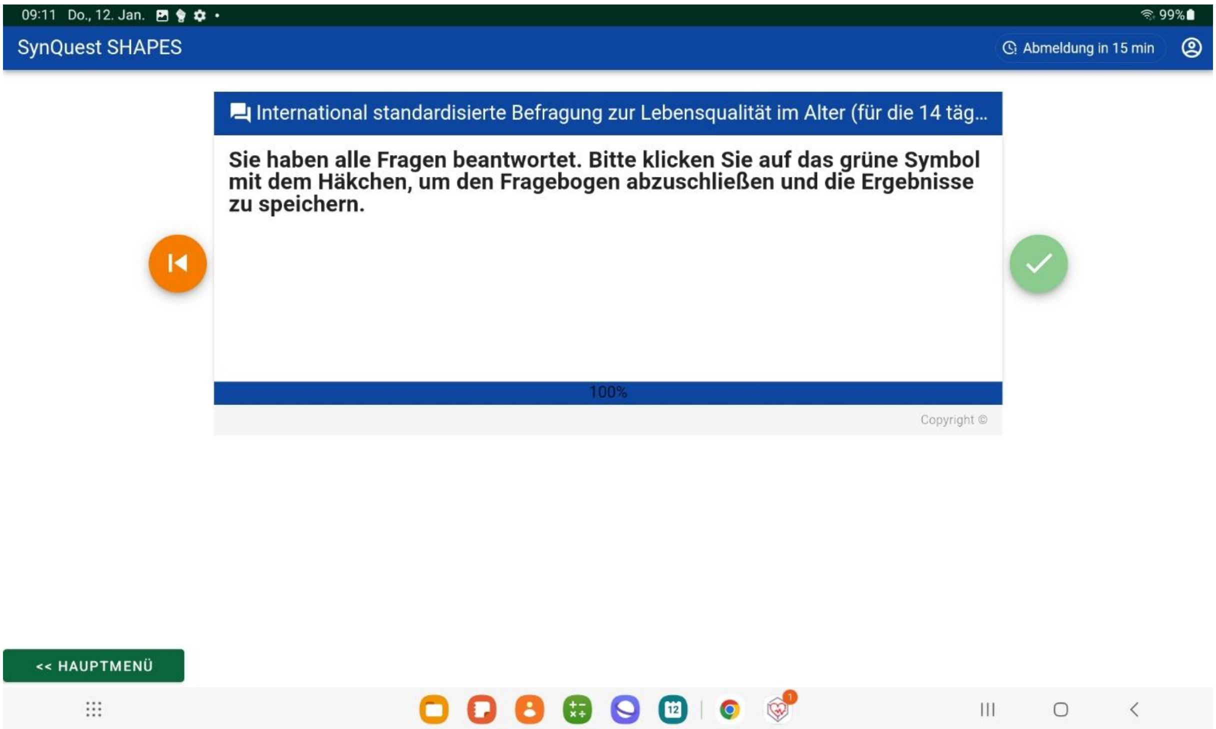
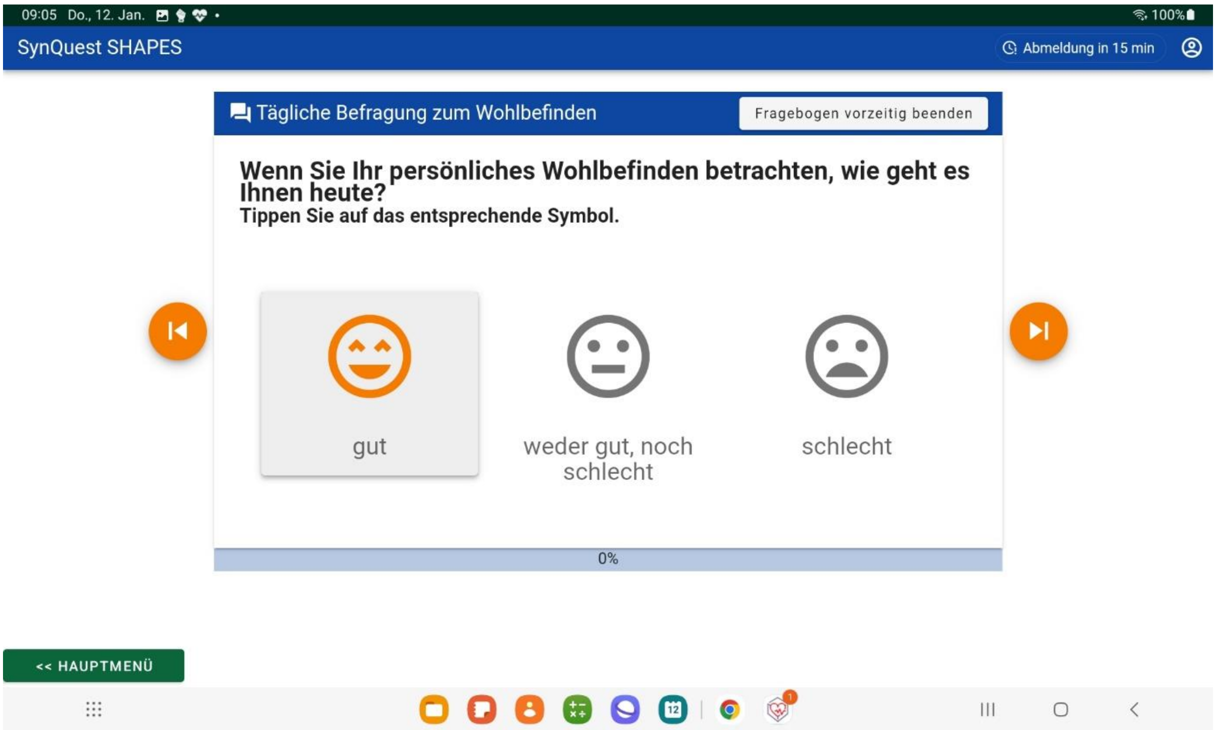


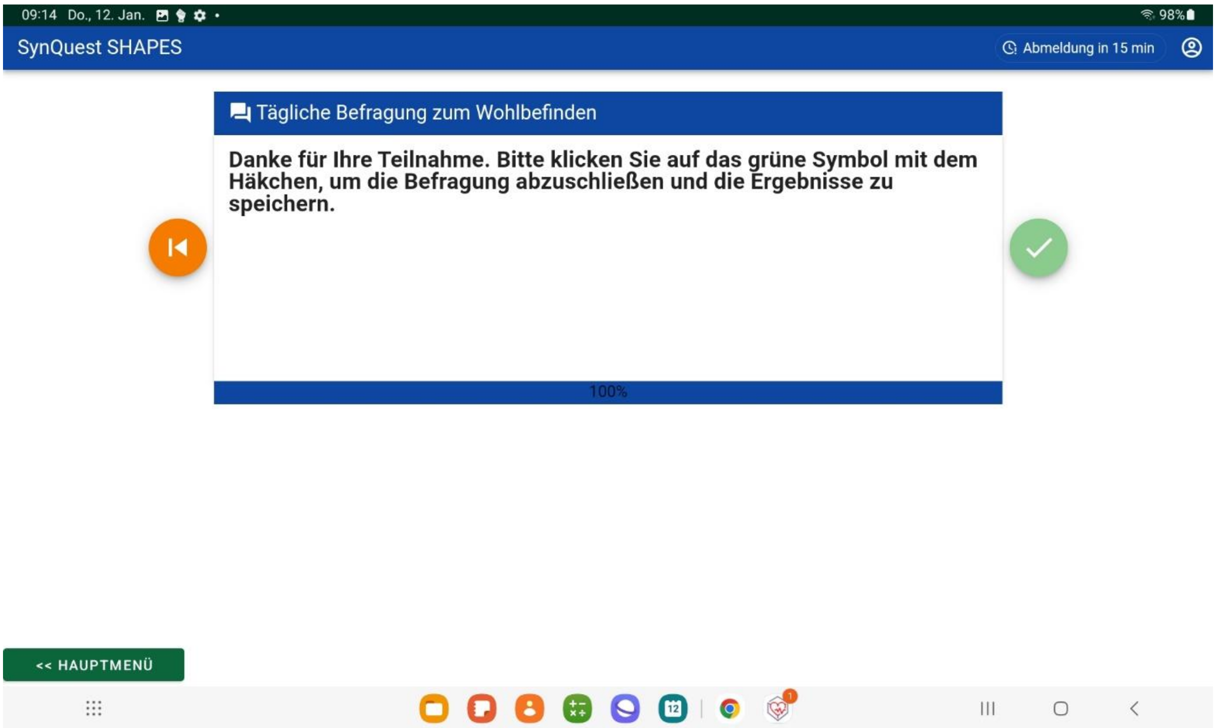
An dem blauen Balken unterhalb der Frage sehen Sie den Fortschritt der Befragung. Am Ende der Befragung wird Ihnen folgendes angezeigt:



Tägliche Befragung:

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

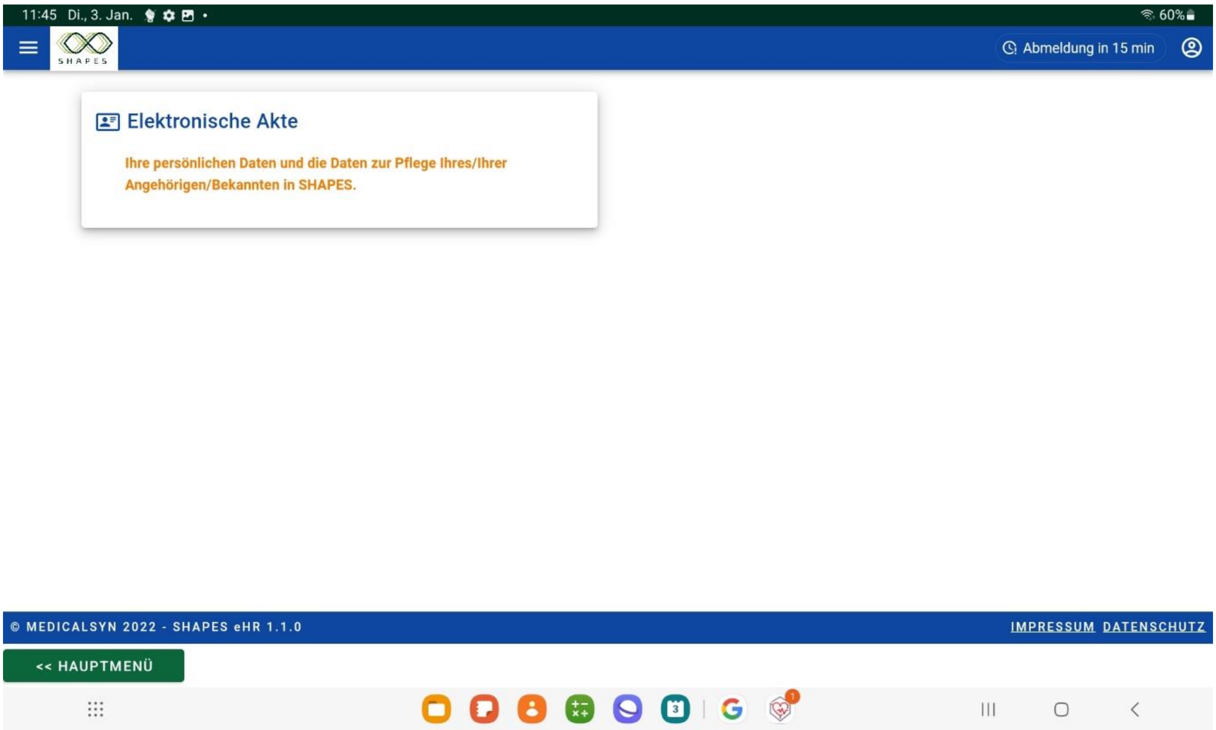




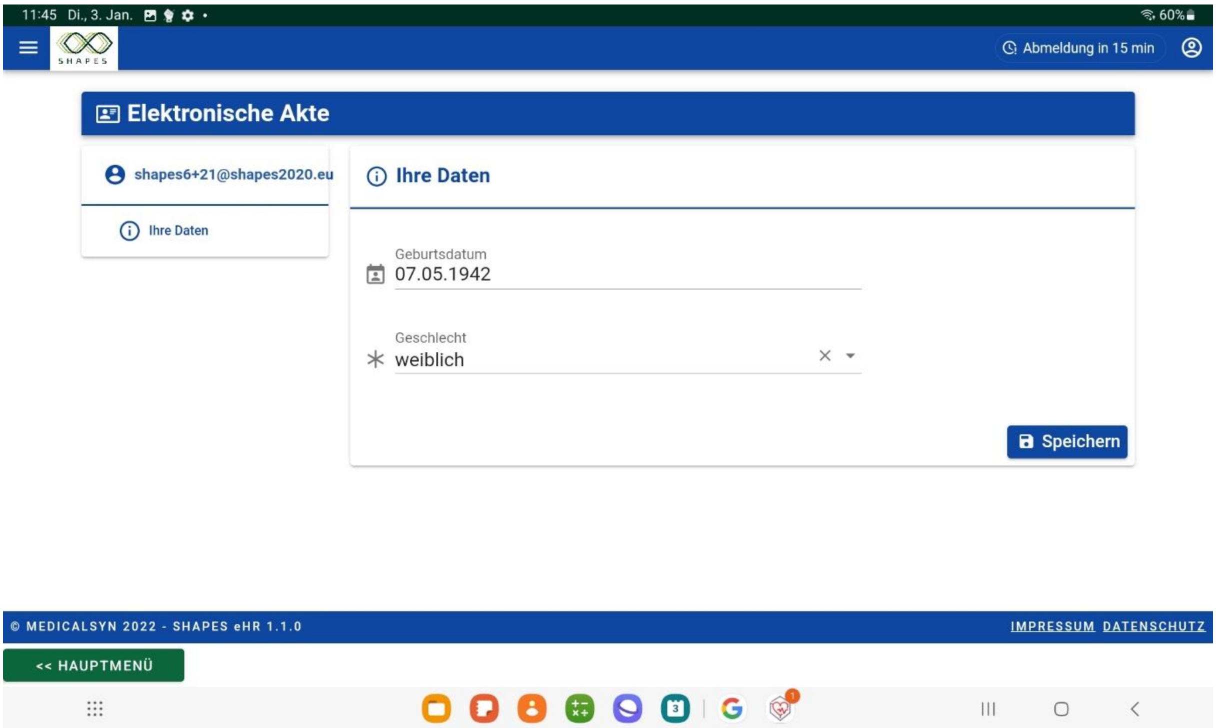
4.8 Benutzerdaten und Profil

Klicken Sie auf das Symbol Benutzerdaten und Profil. Sie gelangen zu folgender Übersicht:

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159



Klicken Sie auf „Elektronische Akte" um zur Ansicht „Ihre Daten" zu gelangen.



5. Fitness Armband

5.1 Aufladen

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

Um die Uhr aufzuladen, müssen Sie die Uhr aus dem Silikonarmband herausdrücken. Anschließend stecken Sie die Uhr in den Adapter. Die goldenen Anschlüsse müssen miteinander verbunden sein (siehe Foto). Die Uhr kann nun mit dem Netzstecker verbunden werden und aufgeladen werden. Es erscheint das Wort „Aufladen". Die Uhr wird nun aufgeladen.

Entfernen Sie nach dem Aufladen die Uhr vom Ladekabel und klicken Sie die Uhr von hinten wieder zurück in das Silikonarmband.

5.2 Installation

Die Einrichtung der Uhr wird vom CCS-Team für Sie übernommen.

5.3 Bedienen

Anzeige ansehen: Tippen Sie kurz auf die Mulde auf dem Display Ihrer Uhr. Anschließend wird Ihnen die Uhrzeit und das aktuelle Datum angezeigt.

Wischen Sie nach oben, um die einzelnen Funktionsbereiche (Benachrichtigungen, Mit App verb. für Updates, Laufband, Mehr, Schritte, Herzfrequenz) zu sehen. Durch weiteres wischen gelangen Sie zum nächsten Funktionsbereich. Eine Übersicht über die einzelnen Bereiche und deren Unterfunktionen finden Sie in der folgenden Tabelle:

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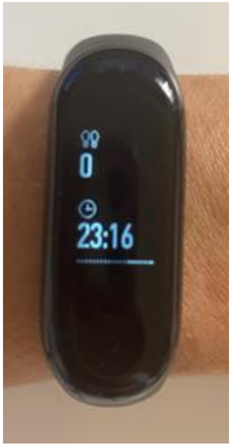
Benachrichtigungen	Es sind keine weiteren Funktionen freigeschalten.
Mit App verb. für Updates	Es sind keine weiteren Funktionen freigeschalten.
Laufband/Übungen 	Hier können Sie eine **körperliche Aktivität** direkt aufzeichnen zum Beispiel bei einem Spaziergang (**Dauer, Herzfrequenz, Schritte pro Minute, Kilometer, Schritte gesamt** und die **Dauer der gesamten Aktivität**) werden angezeigt. Halten Sie zum Start der Aktivität die Mulde auf dem Display bis zur Vibration gedrückt. Anschließend startet die Aufzeichnung. Wischen Sie nach links, um alle Parameter sehen zu können.    Um die Aufzeichnung zu stoppen, halten Sie die Mulde auf dem Display gedrückt. Drücken Sie erneut und Sie gelangen zurück zum Hauptmenü.
Mehr	➢ **Stoppuhr:** Wischen Sie von rechts nach links und Sie gelangen zur **Stoppuhr.** Drücken Sie die Mulde auf dem Display um die Zeit zu starten. Um die Zeit zu stoppen, drücken Sie II (Pause). Um die Zeit weiterlaufen zu lassen drücken Sie > (Play). Für einen Neustart die Mulde auf dem Display bis zur Vibration drücken (genauso kommen Sie auch zurück zum Hauptmenü).

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<table>
<tr>
<td></td>
<td>


Gerätesuche: Es sind keine weiteren Funktionen freigeschalten.
Bildschirm: Halten Sie die Mulde auf dem Display gedrückt und Ihnen wird auch hier das Datum und die Uhrzeit angezeigt.
Werkreset: Hier kann die Uhr auf die Werkseinstellungen zurückgesetzt werden.

</td>
</tr>
<tr>
<td>Schritte & Akku</td>
<td>
Hier werden Ihnen ihre täglichen Schritte angezeigt. Wischen Sie von rechts nach links, wird Ihnen die aktuelle Akkukapazität angezeigt.


</td>
</tr>
<tr>
<td>Herzfrequenz</td>
<td>Drücken Sie für einige Sekunden auf die Mulde auf dem Display bis das Gerät vibriert. Anschließend erfolgt die Messung. Diese dauert ebenfalls einige Sekunden. Achten Sie darauf, dass die Uhr fest am Handgelenk/Arm sitzt. Drücken Sie bei fehlgeschlagener Messung die Uhr leicht auf ihren Arm. Anschließend wird Ihnen ihr Puls angezeigt.</td>
</tr>
</table>

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Um einen Schritt zurück zu gelangen, müssen Sie jeweils auf die Mulde auf Ihrem Display tippen.

6. Smart Socket (intelligente Steckdose)

6.1 Installation

Die Installation wird vom CCS-Team durchgeführt.

Die LED des Geräts leuchtet ROT, wenn kein Internet-Zugang möglich ist. Ist der Stecker verbunden, leuchtet der Stecker lila – siehe Bild.

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7. Luftqualitätsmesser

7.1 Installation

Es ist keine Installation notwendig. Das Gerät muss lediglich an die Stromversorgung angeschlossen werden.

8. Gateway

8.1 Installation

Die Installation wird vom CCS-Team vorgenommen.

Das Gateway ist die Zwischenzentrale zwischen den Smart Socket (intelligenten Steckdosen), dem Luftqualitätsmesser und der Anwendung auf dem Tablet. Schließen Sie das Gerät an die Stromversorgung an und verbinden Sie das Gateway mit einem LAN-Kabel mit ihrem WLAN-Router.

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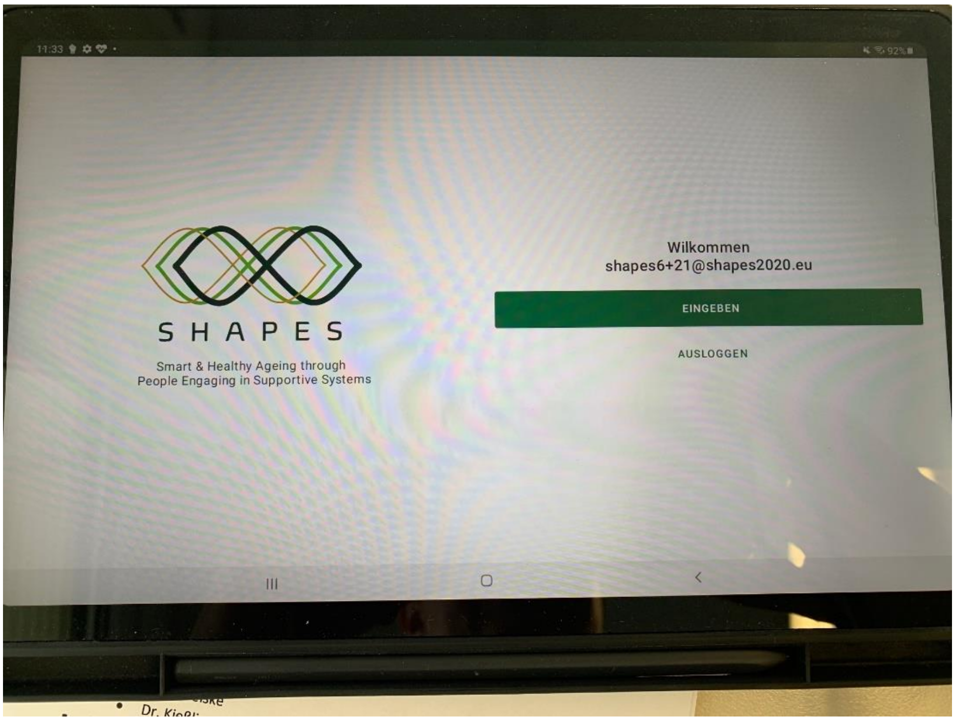
Annex 12

UC-PT1-001 Feedback for technical partners phase 4

1) UC-PT1-001

Feedback Ecare 21.09.2022



I have check it again today in the SHAPES Front End App with my SHAPES ID – see it on the picture.

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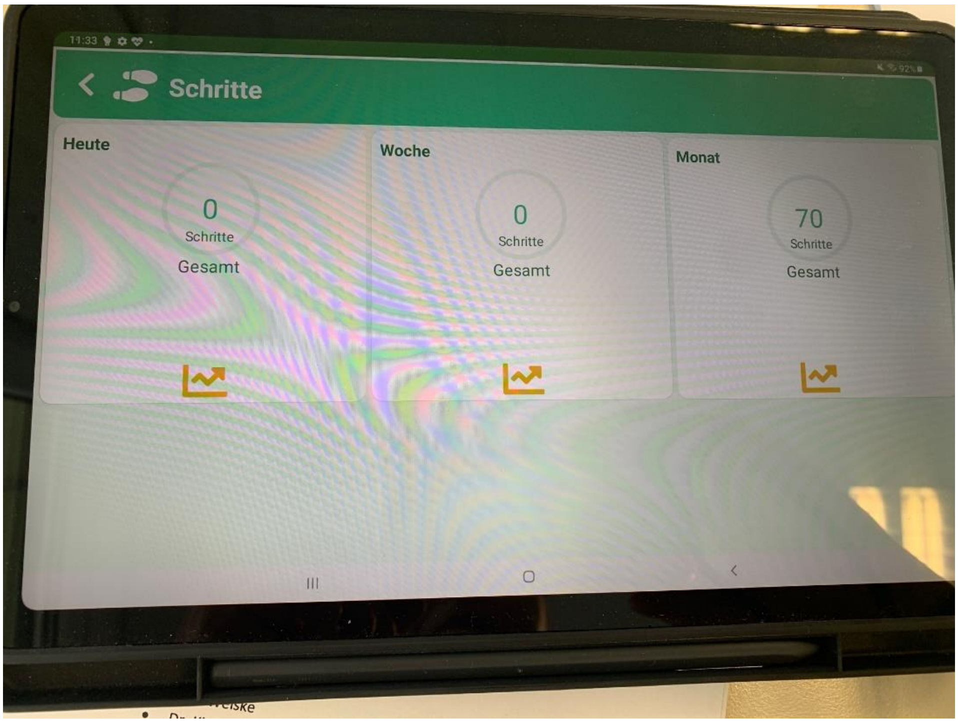
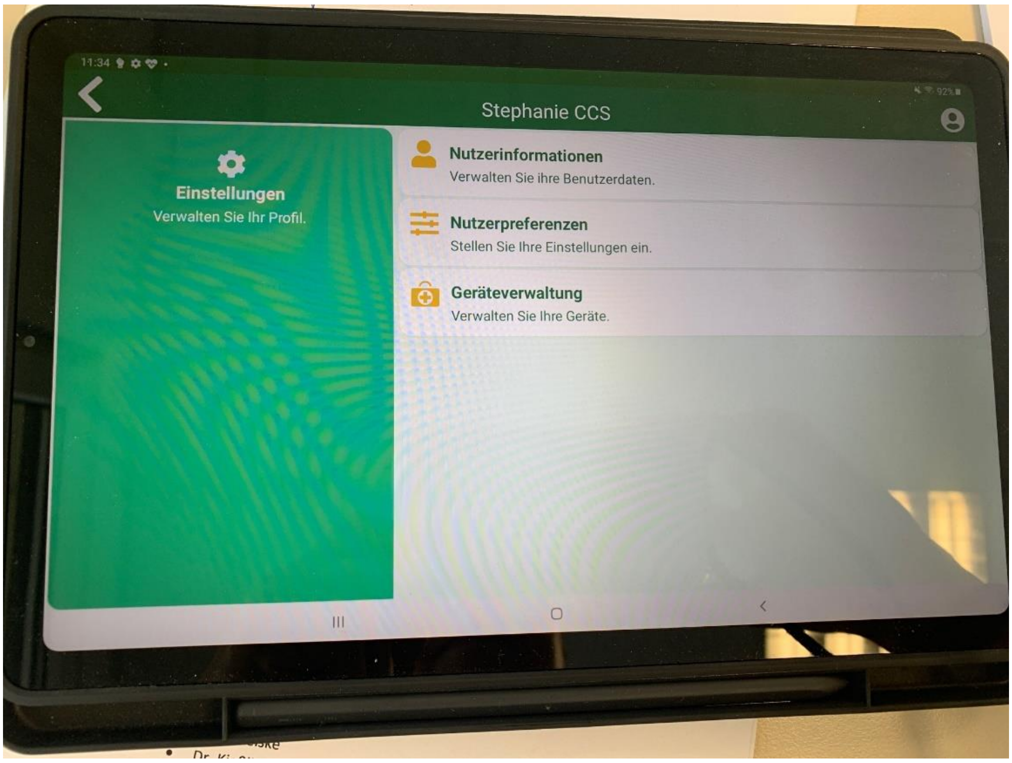
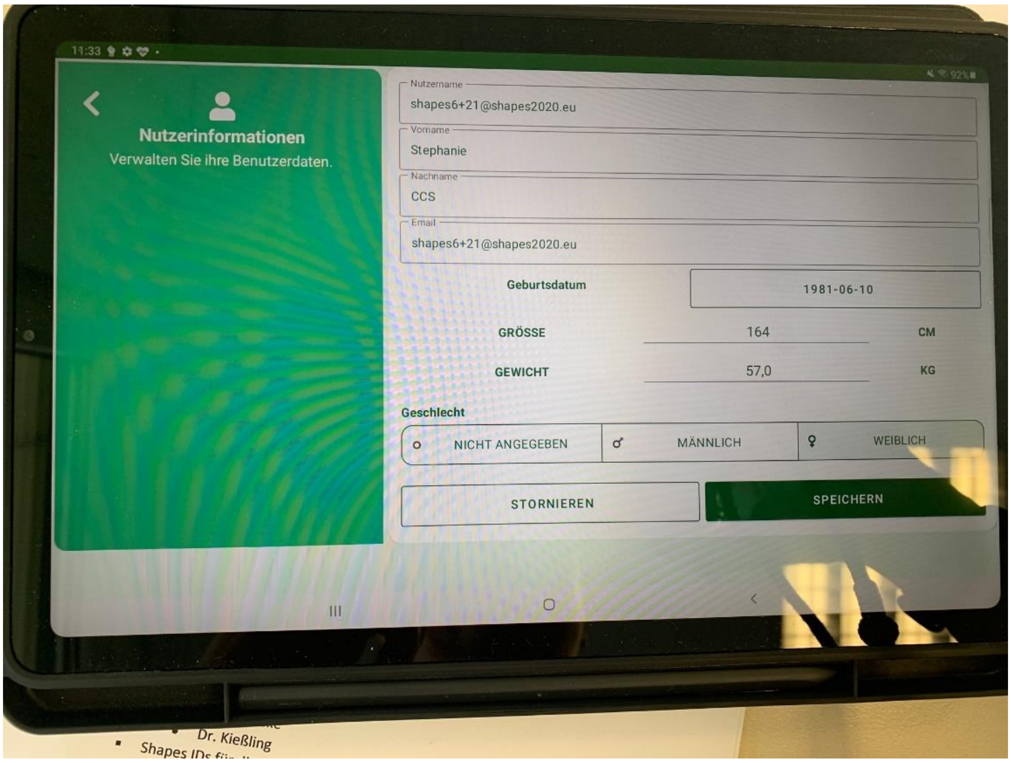


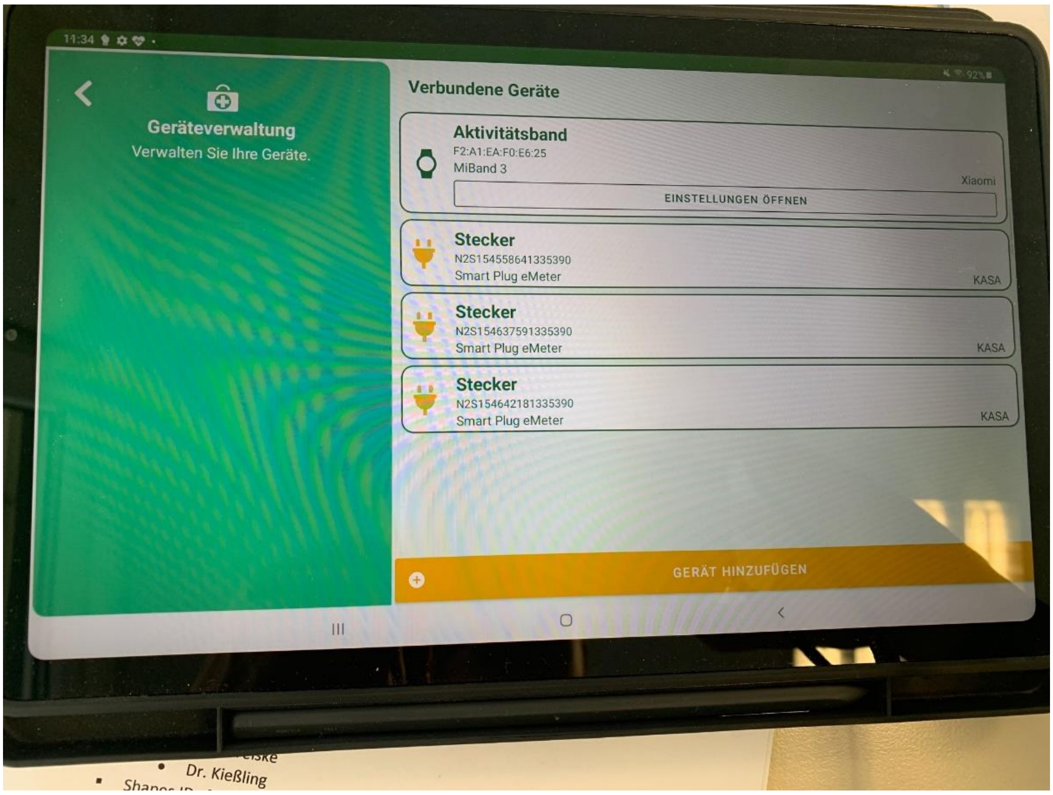
There is still no data on this account.



After that, I check the settings.



The user profile – everything okay in my opinion.



After that, I check the device management – the right fitness tracker is connected, I think.

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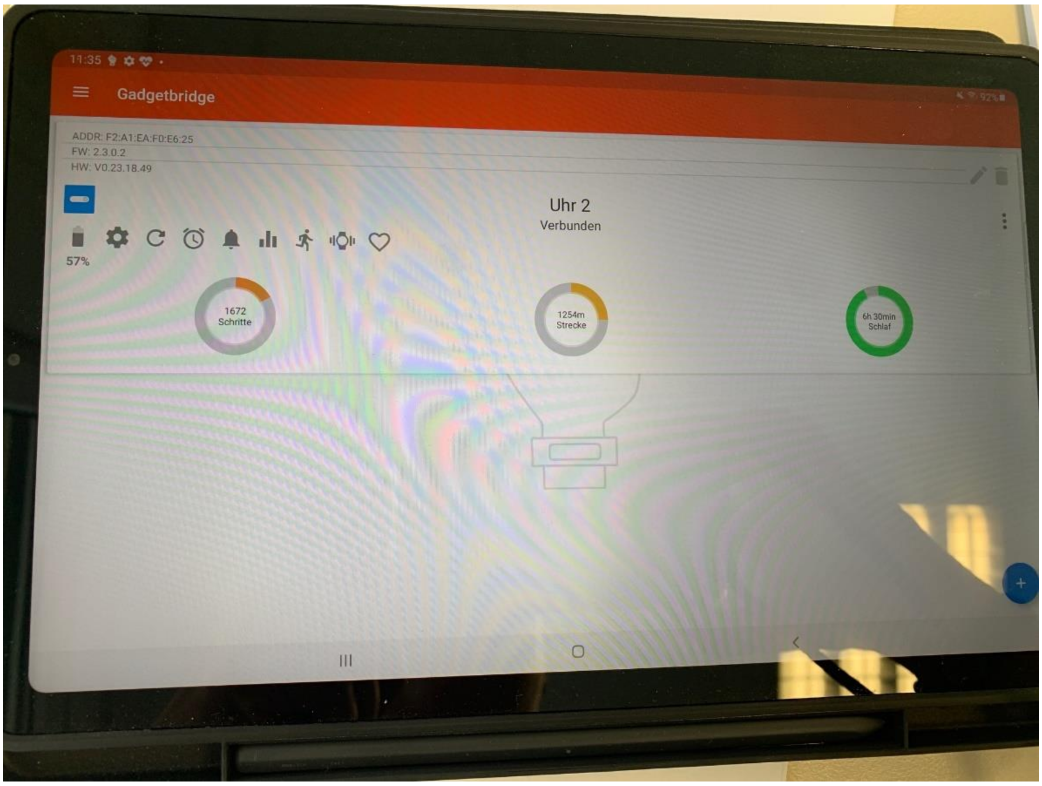
F2:A1:EA:F0:E6:25



After that I check the gadgetbridge: The same fitness tracker is connected with the gadgetbridge – this is the fitness tracker I am wearing right now (and all the time). The data in the gadgetbridge are correct.

Maybe this will help you to identify the problem and find a solution.

I think it will be related to the different log ins – first ccs002 and now the SHAPES ID.

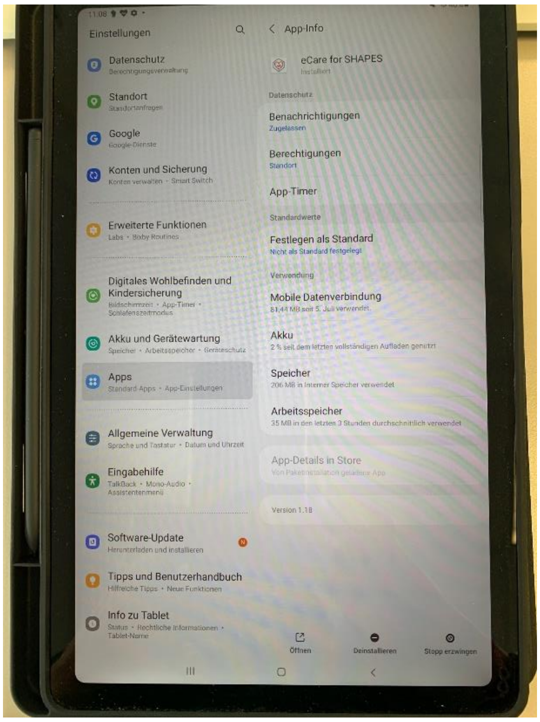
2) <u>SHAPES Pilot 1 – UC001</u>

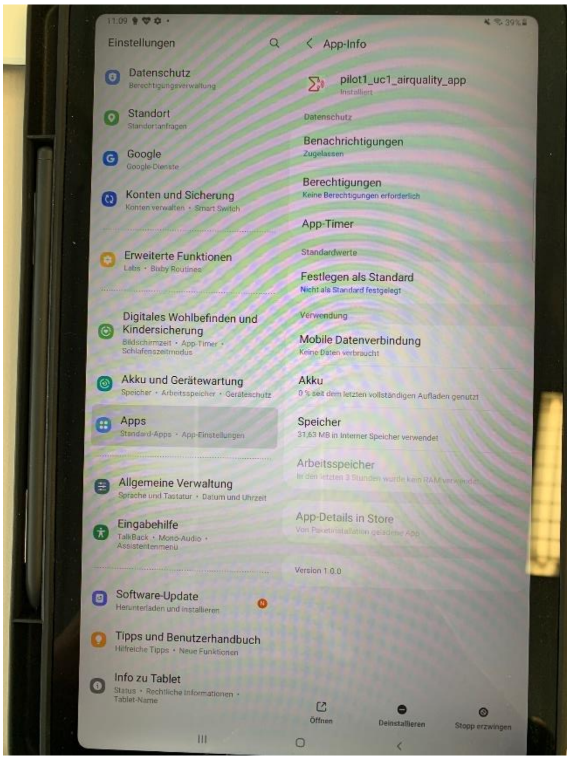
<u>Phase 4</u>

Feedback Tec Partner 27.09.2022

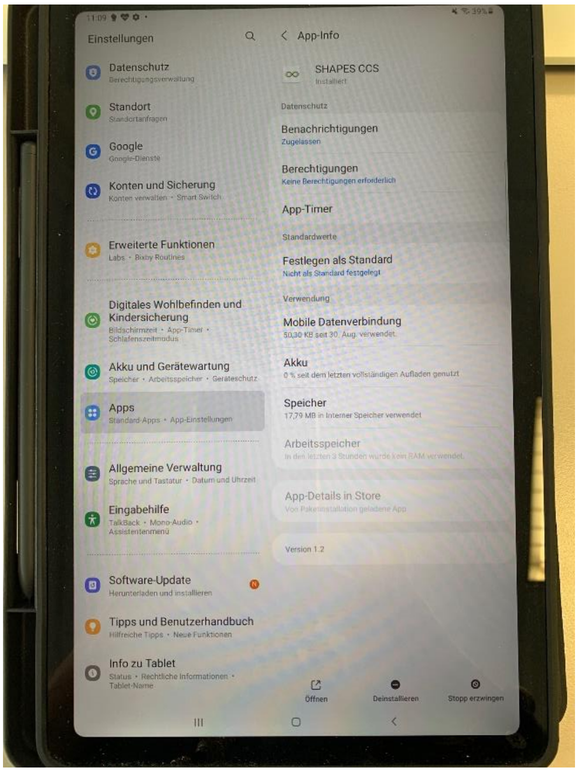
Updated Version eCare

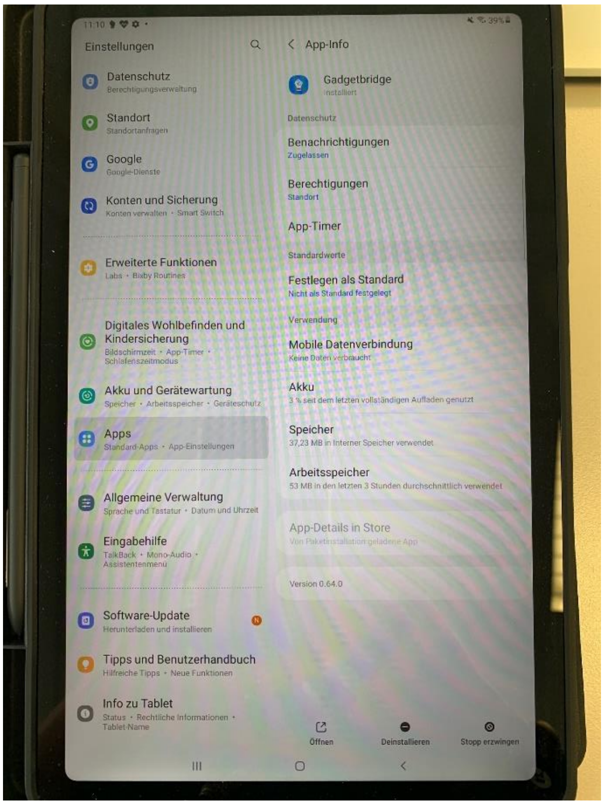
Control of the version of each digital solution:



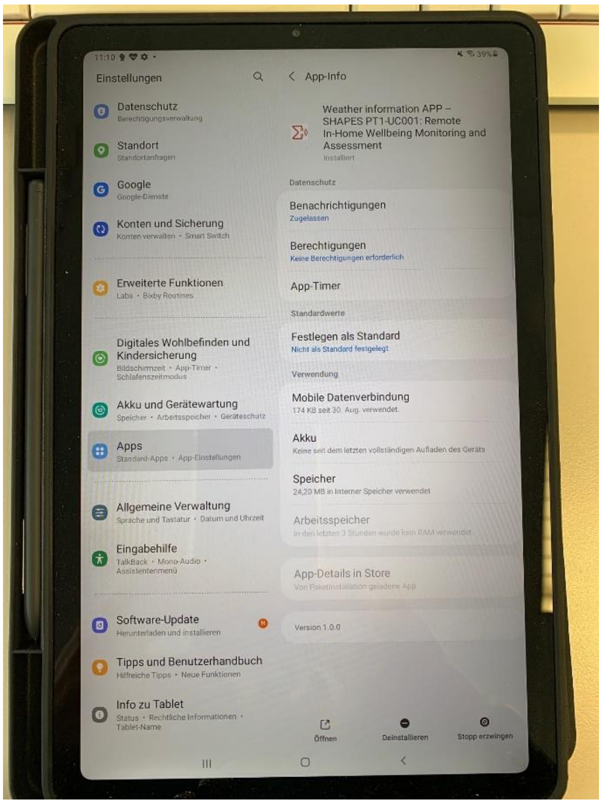


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159





This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159



Do we have the right version from each digital solution?

Question:

How does eCare uddate and how does Gadgetbridge update?

Now, I first have to “put” the data manually into Gadgetbridge and only after that, after some time (10 minutes) I am able to look at the data in eCare. Can this process be automated?

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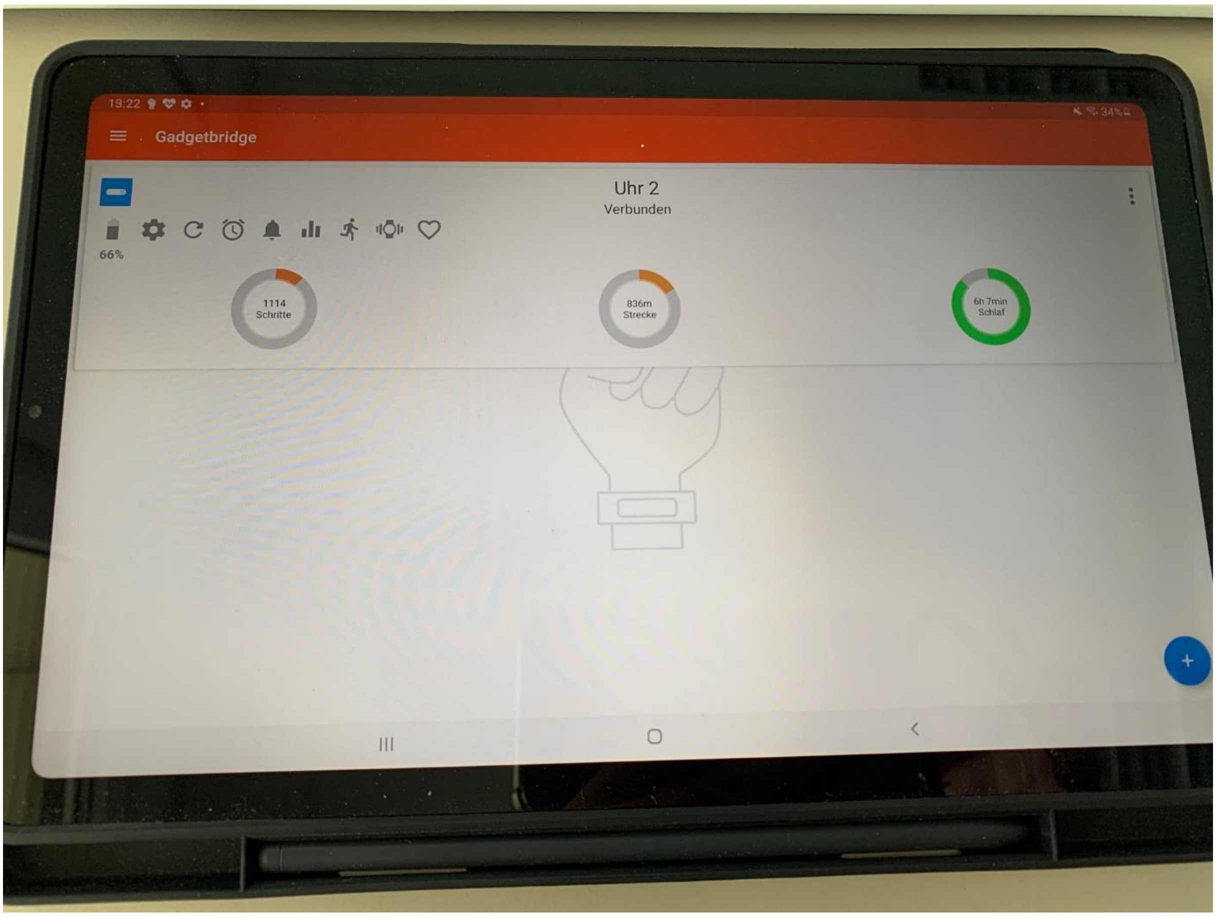
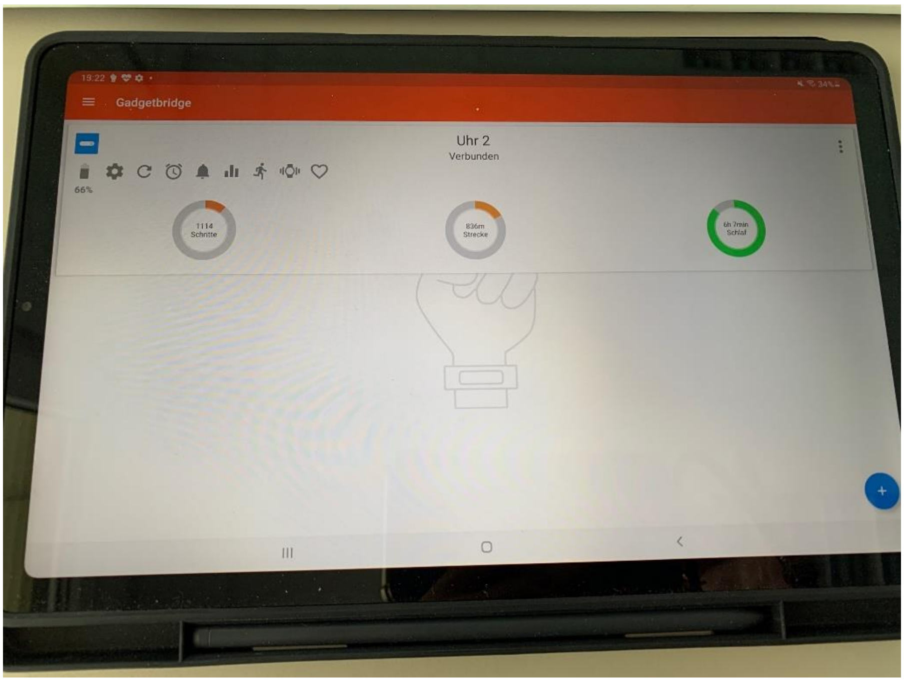
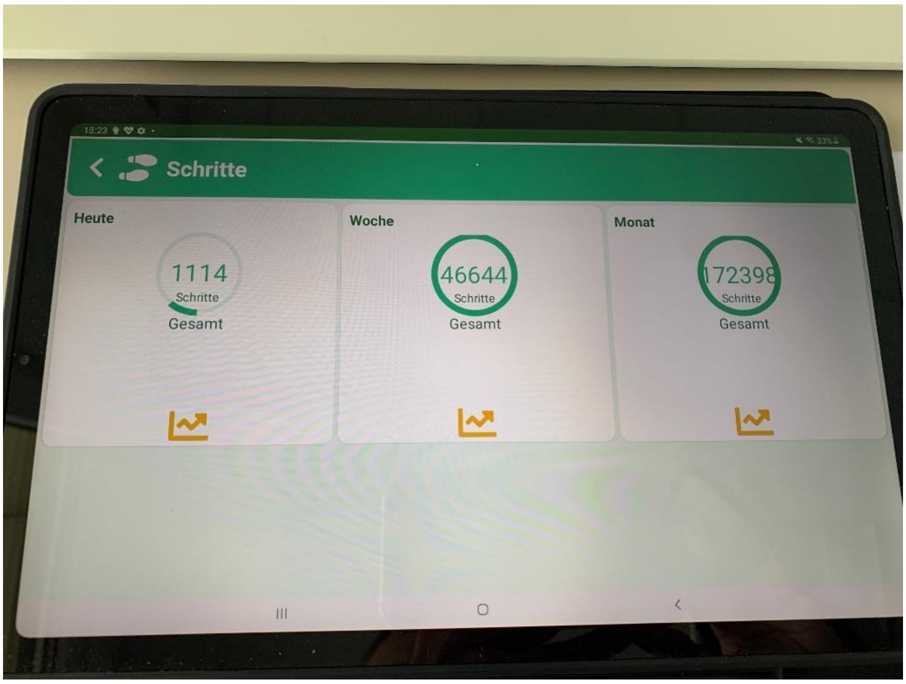

18:22
Gadgetbridge
Uhr 2
Verbunden
66%
1114
Schritte
836m
Strecke
6h 7min
Schlaf

The display of the steps are correct:





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However, the display in Ecare should be improved.

In the bar chart, the days must be correctly assigned to the columns - weekday (Monday/Tuesday/Wednesday etc) **and** date in the middle under the respective column.

The daily list next to it must also be labelled differently - not one day ago, two days ago, etc.... but with the weekday (Monday/Tuesday/Wednesday etc.) and the respective date.

The same applies to the monthly display.

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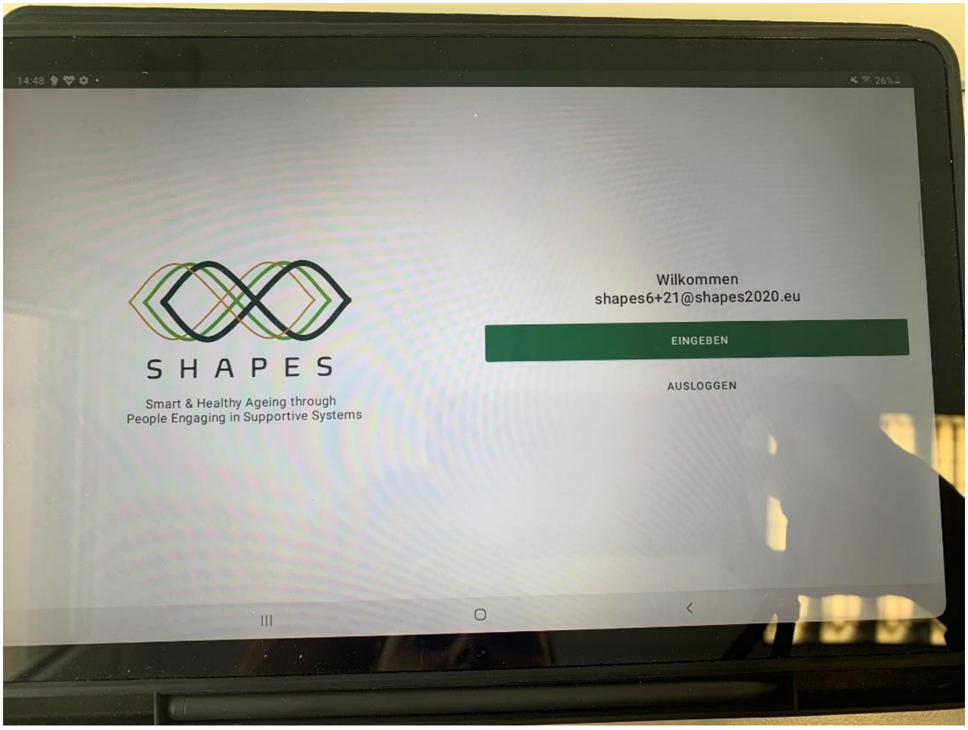
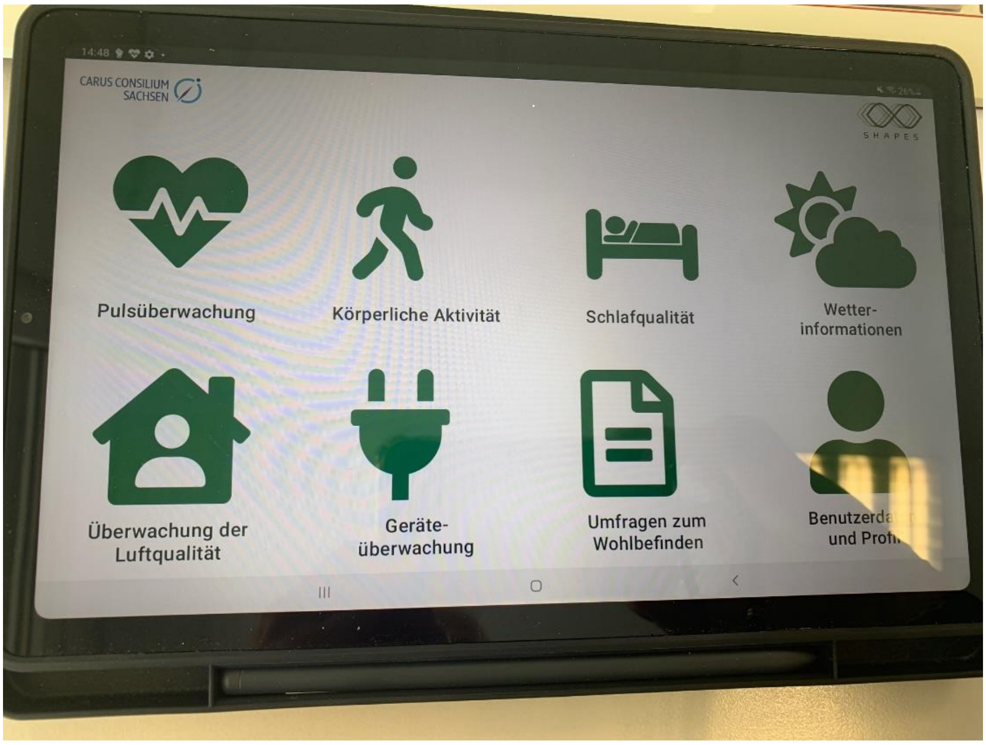
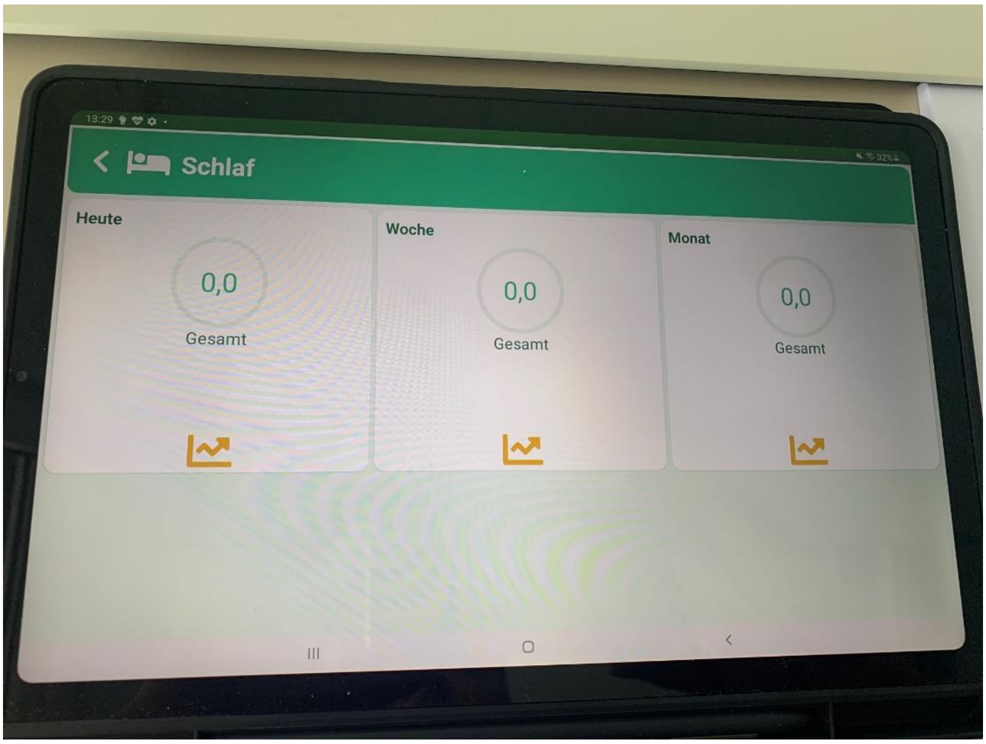
Sleep data:

The sleep data in the Gadgetbridge are correct.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159





If I use this way (SHAPES Front End App – Sleep) to show me the sleep data in SHAPES, then I get this display with no data.

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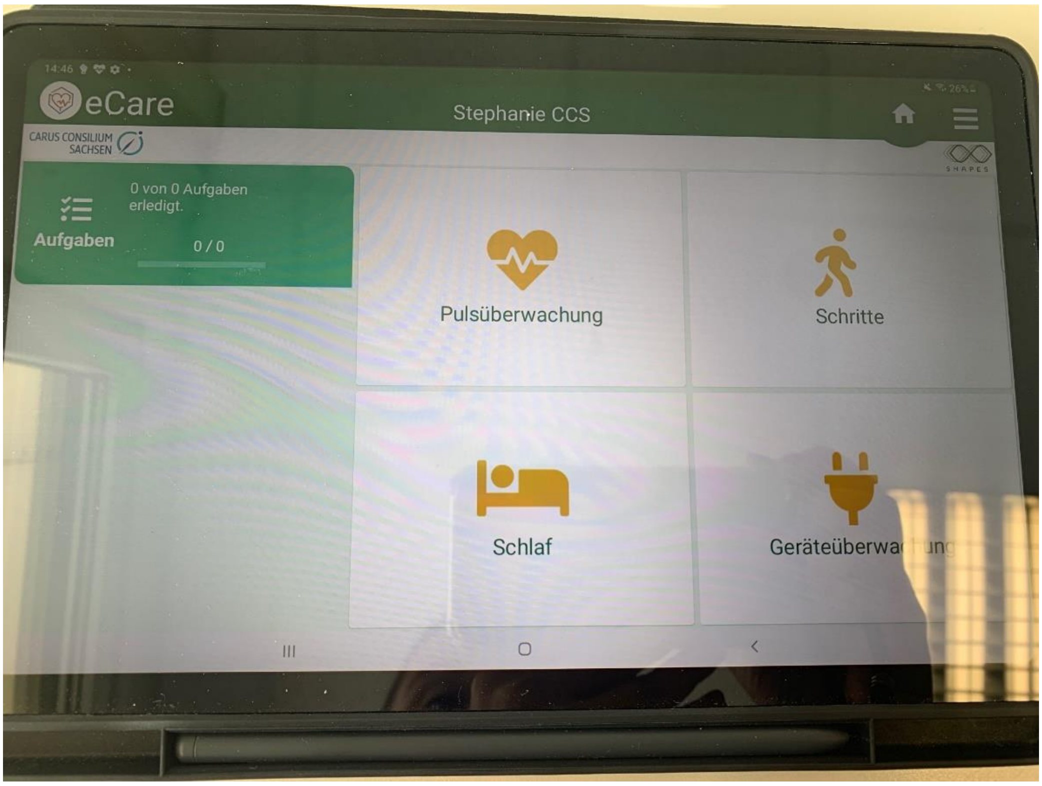
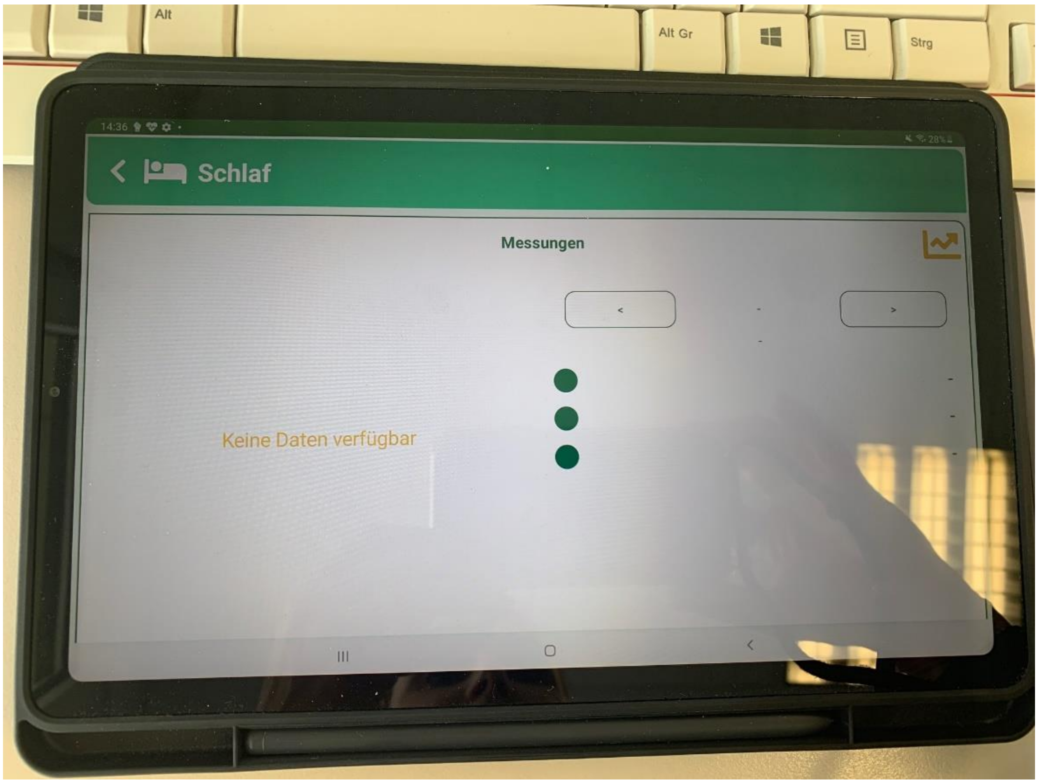
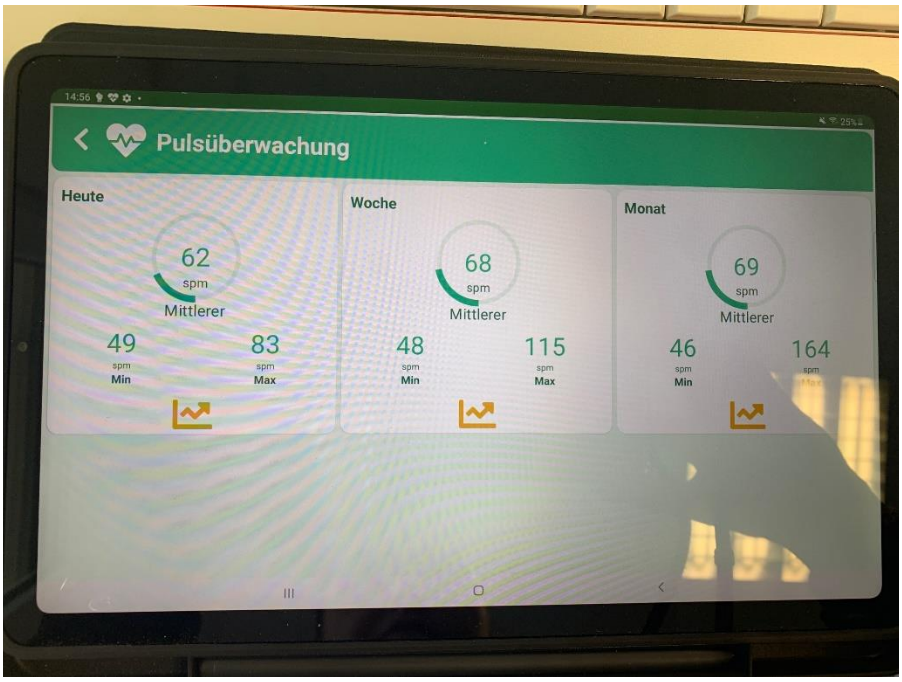
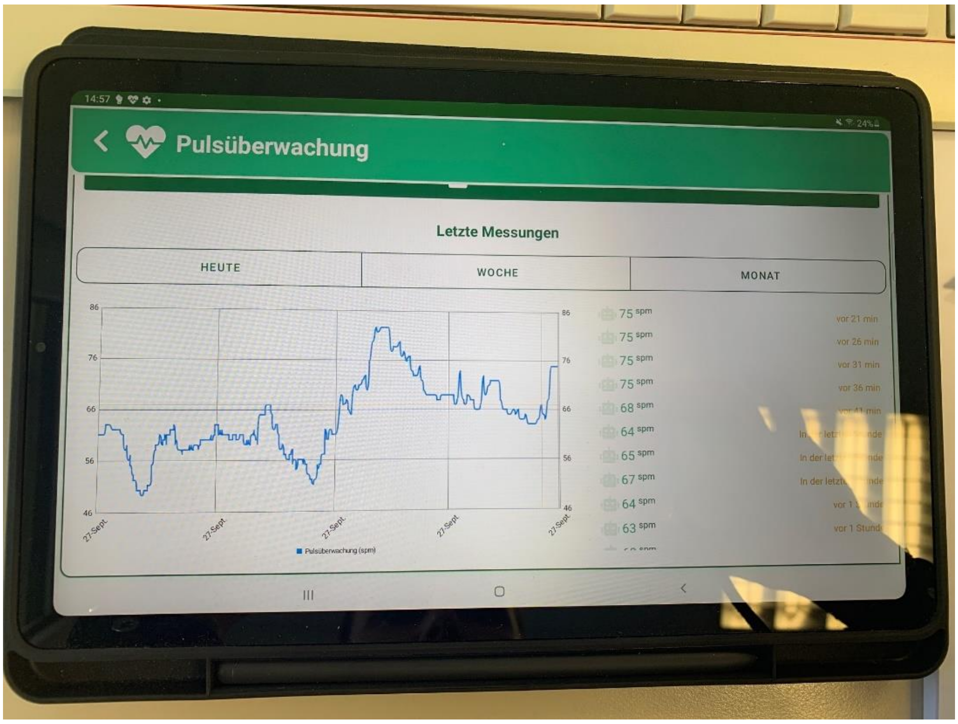




And if I use this way – directly eCare App – sleep – it looks like this.

Heartrate:





Here also the issue with the name of the days.

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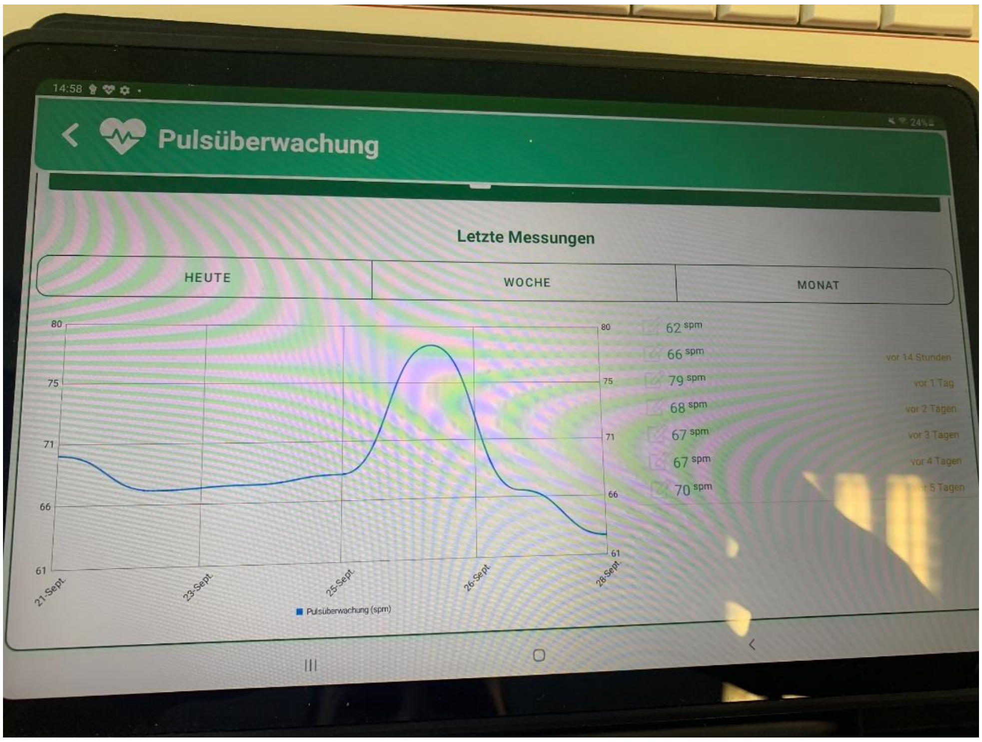

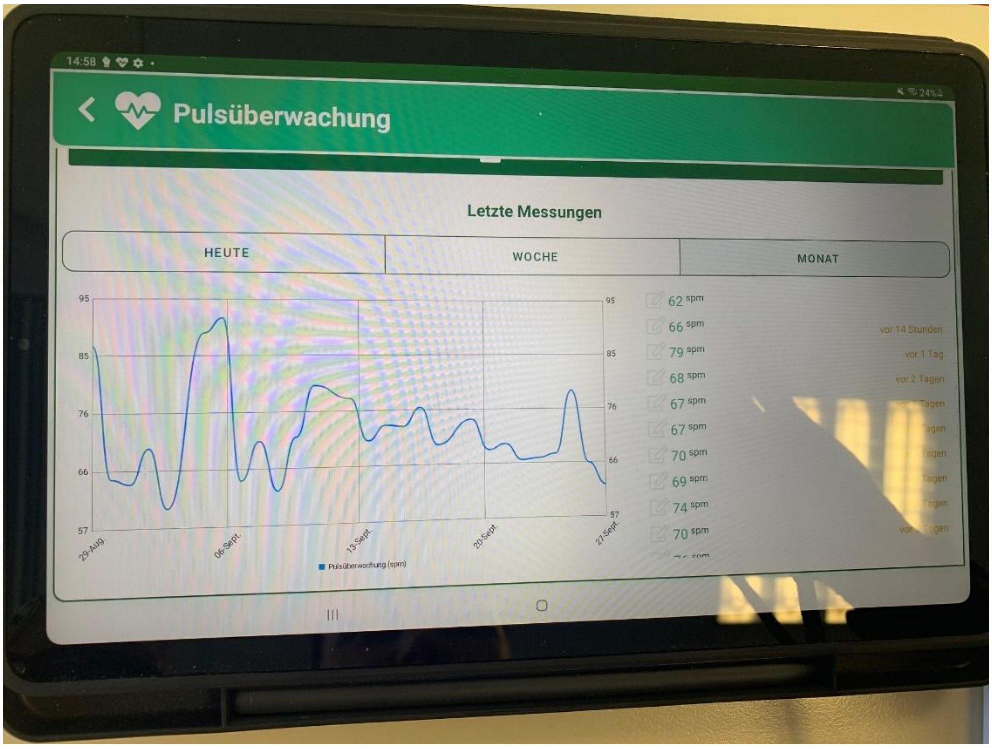

Heartrate seems to be correct

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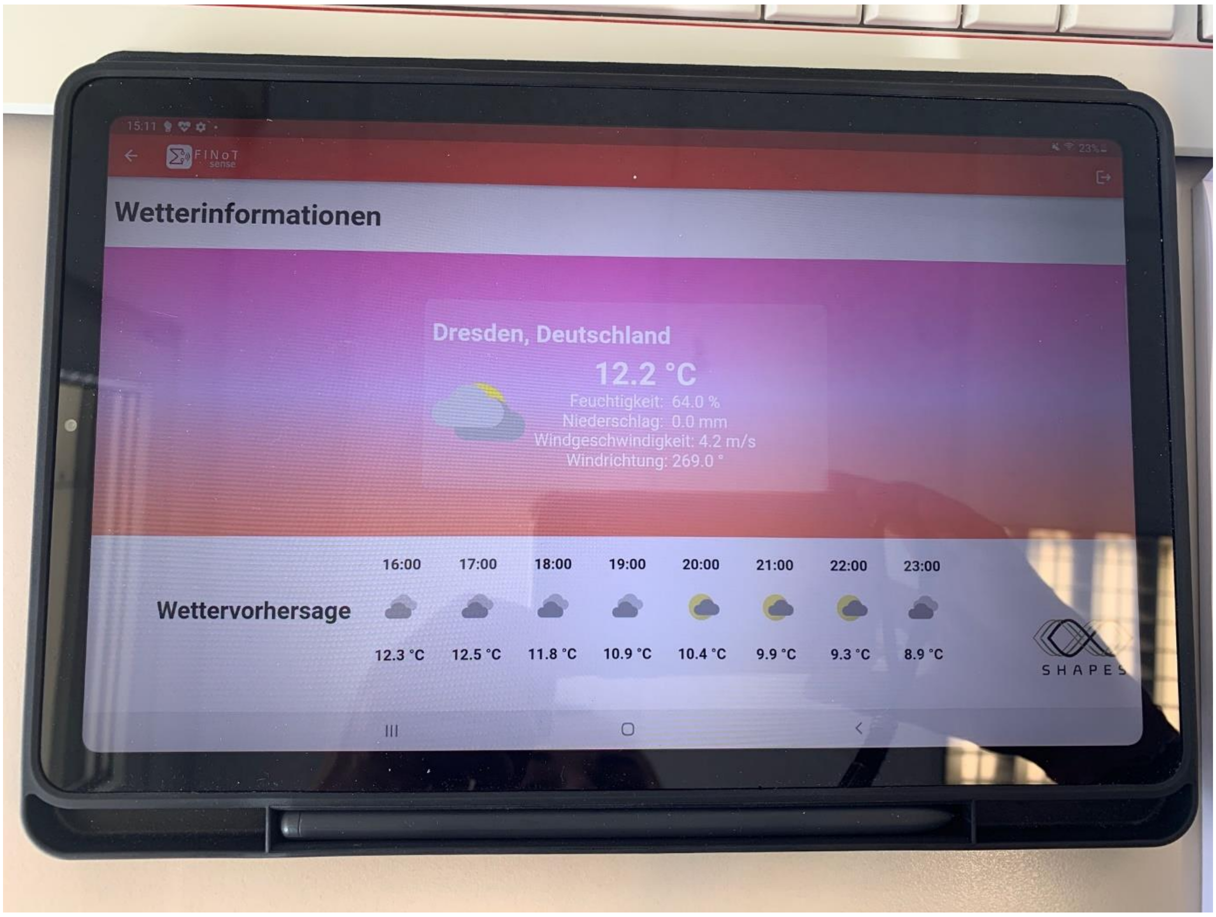
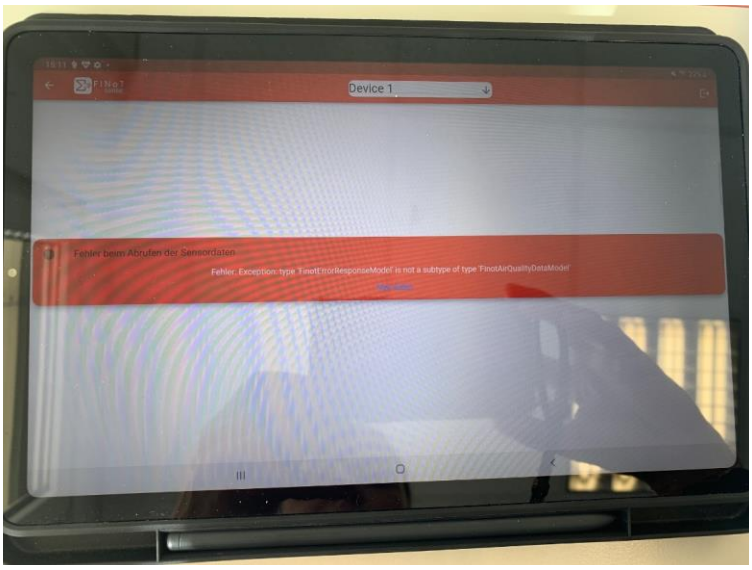
Weather:



I have checked the weather information with another app, and it seems to be correct.

Air quality



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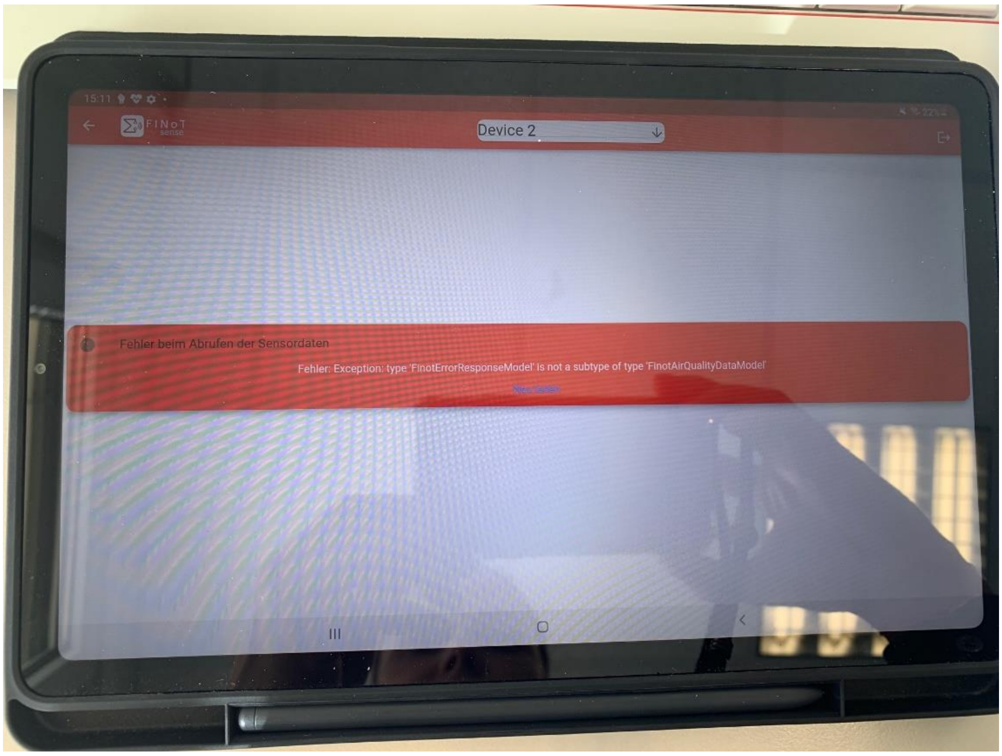
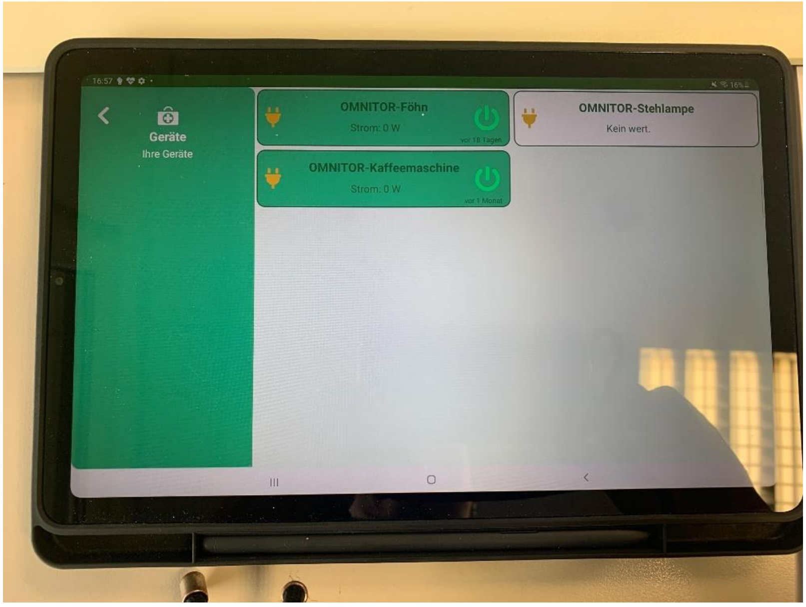


There is something wrong.

The gateway is online, I think so and I have installed **one** air quality node, but I see, there is no data.

And I have only one device not two.

Device monitoring:



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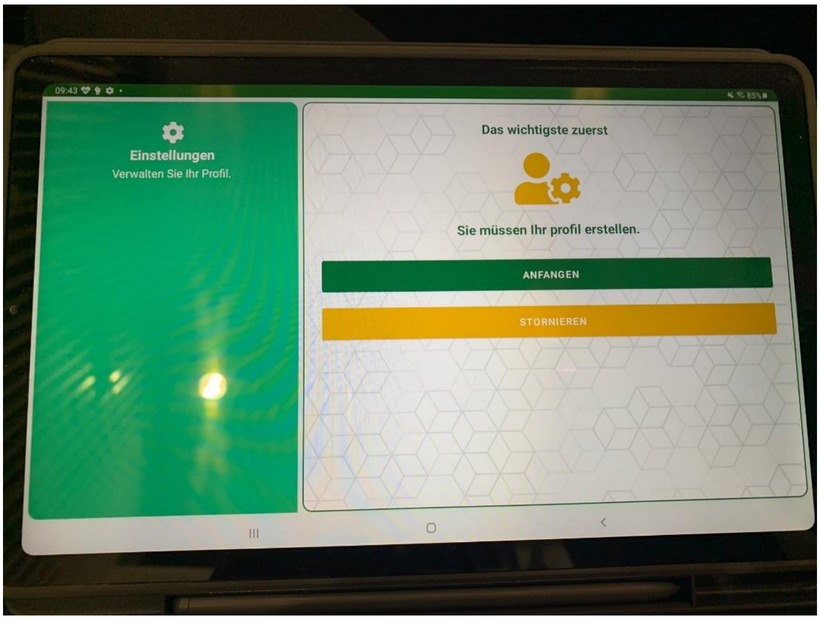
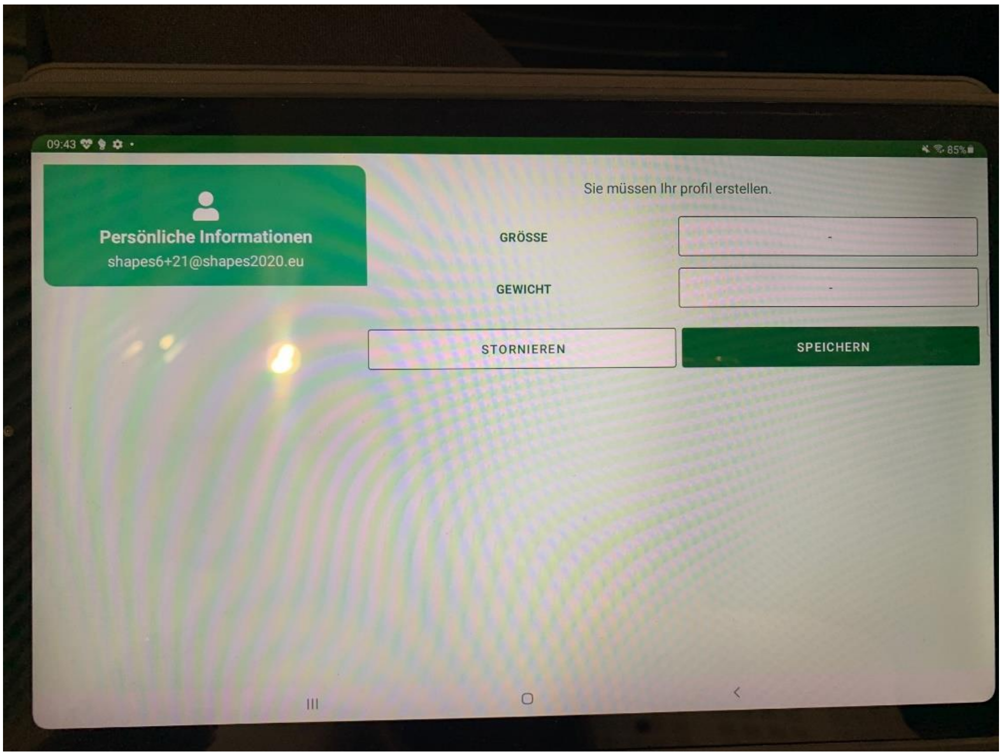
I have to check the smart plugs, because there is no data.

User profile:

I have tried to fill in the user profil:





Why do we need size and weight?

We will not need or use it for PT1.

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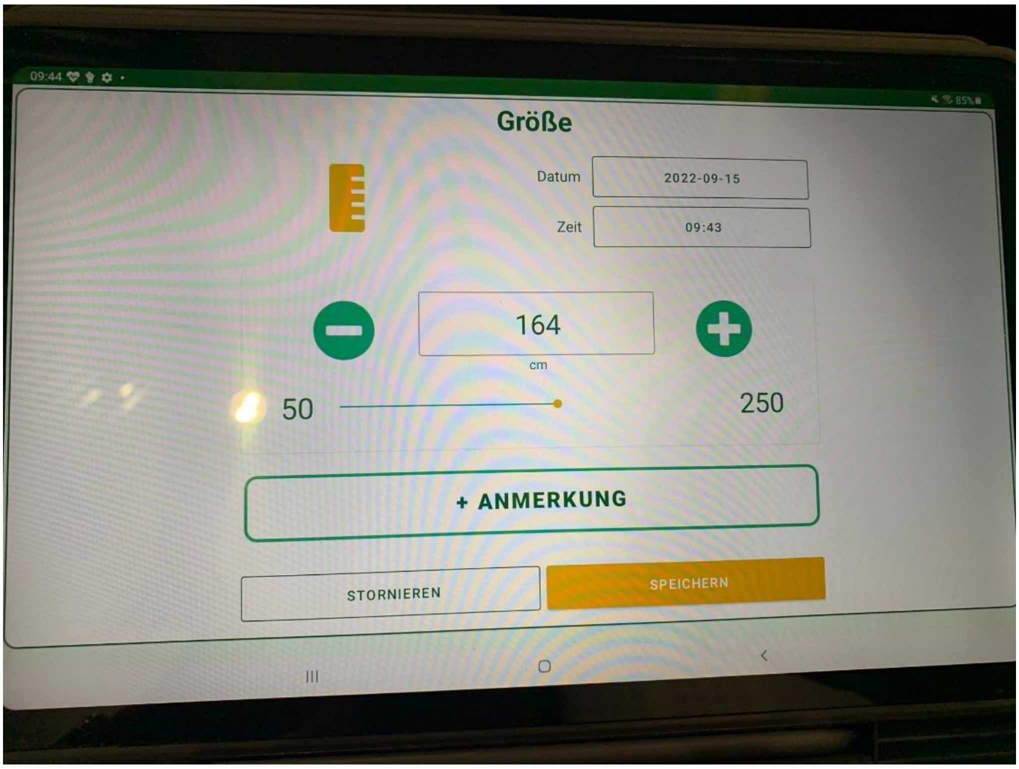
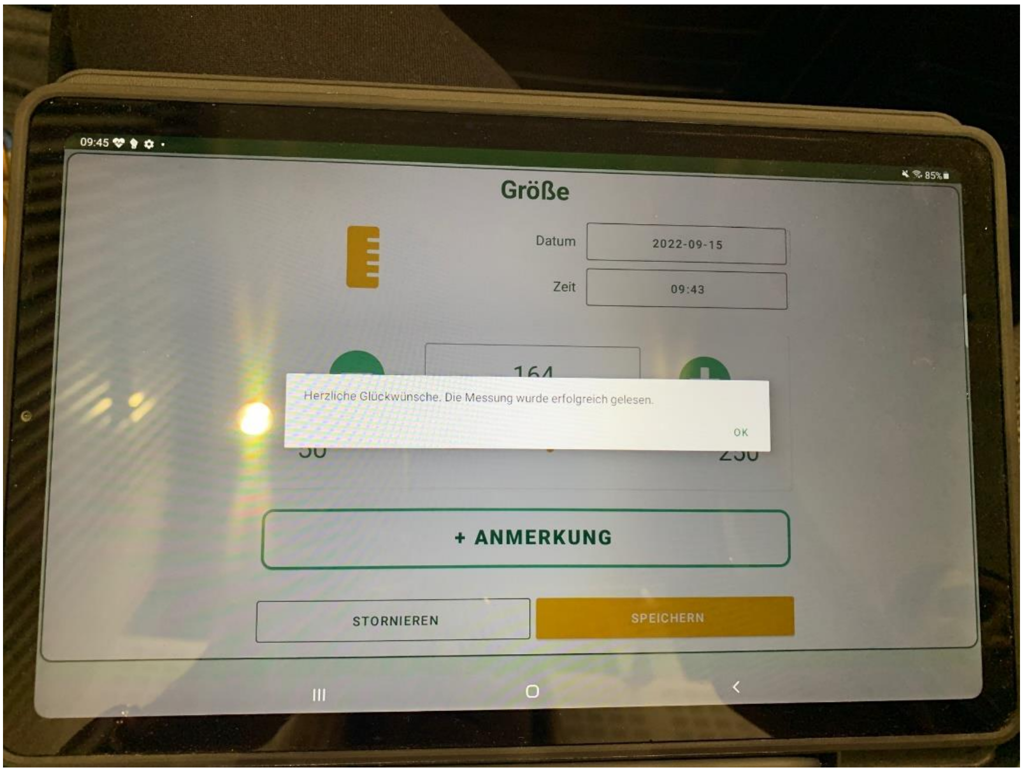
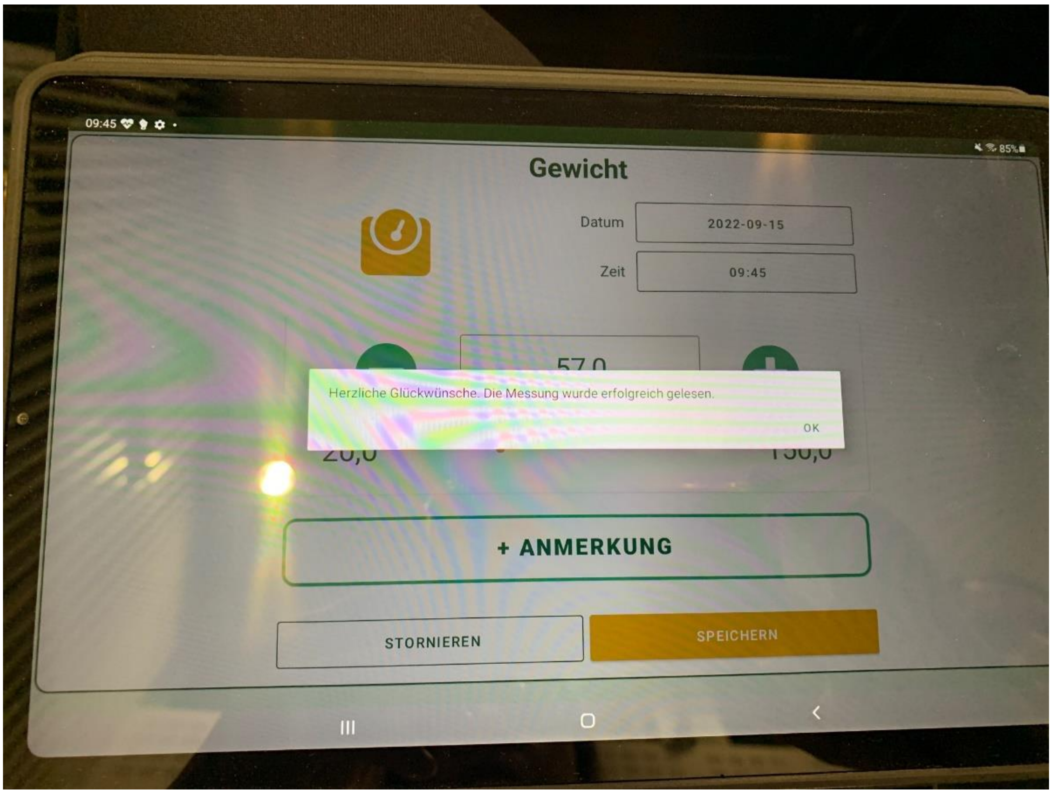
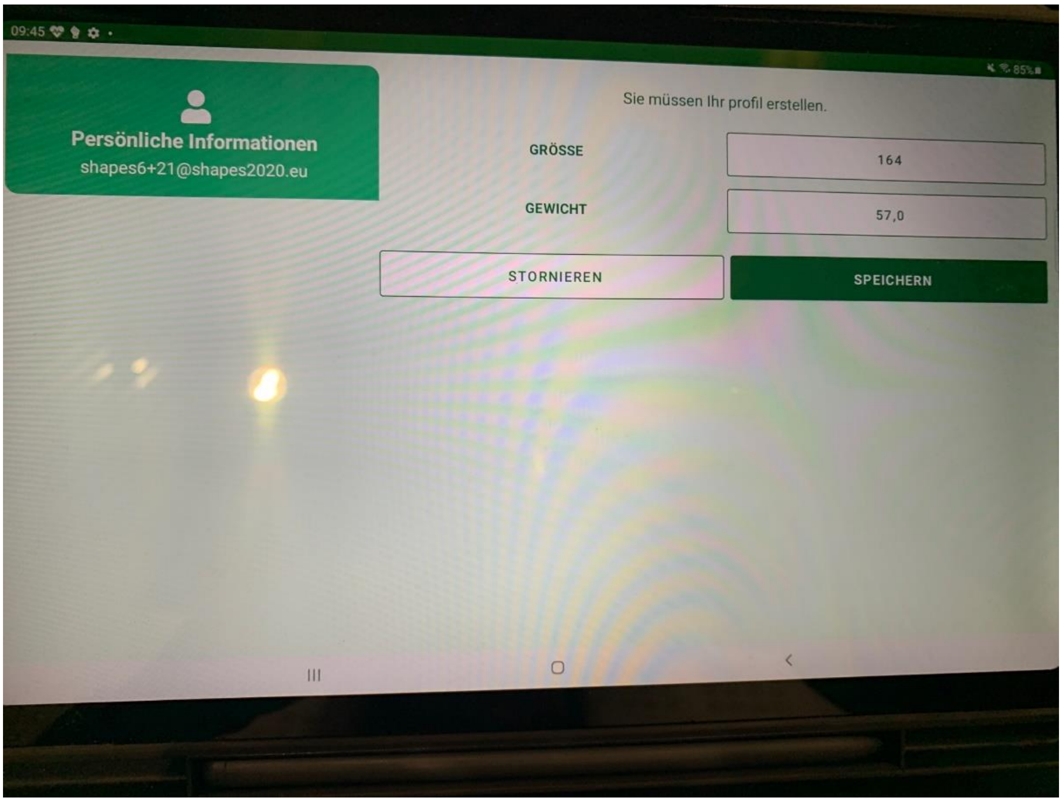


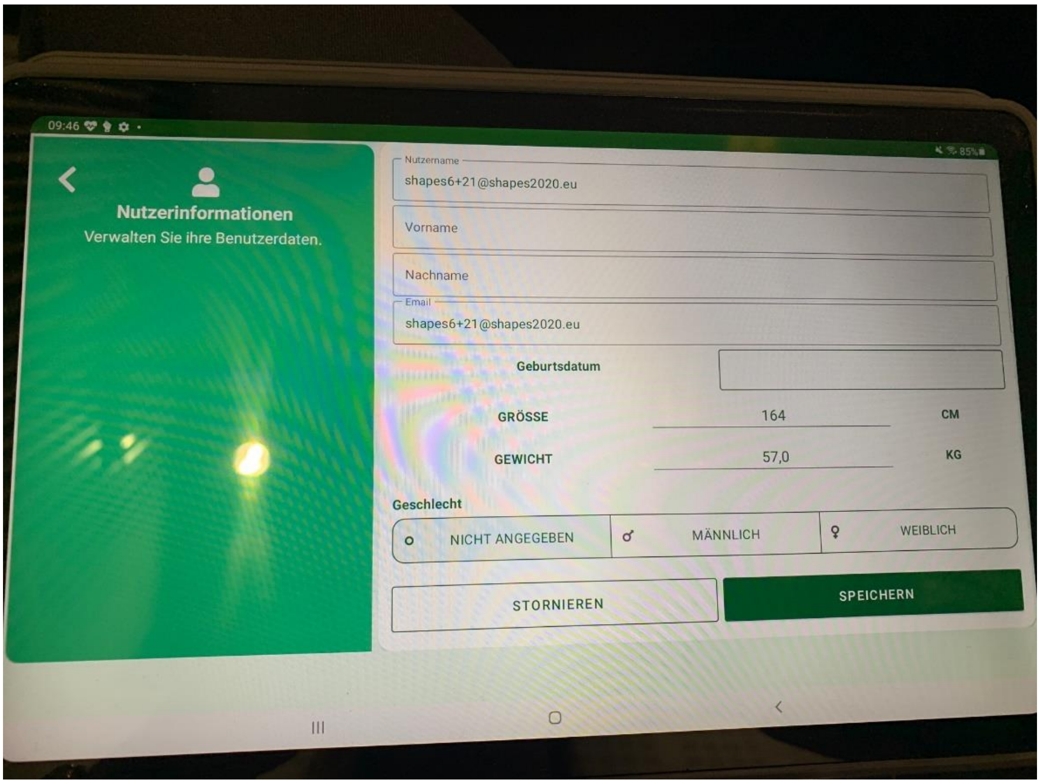


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159





This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159



Why do we need here first and last name?

In my opinion, our participants get a SHAPES ID and only the pilot leader knows the real name. This would mean that personal data would be well protected.

Or should we give “alias names” – like participant 1 (First name), CCS (last name).

Also the date of birth? I think we do not need it – just only the age – also because of private security.

Or should we give the participants a pseudo (not real) date of birth – maybe with the right year but not with the real month and day – also because of private security.

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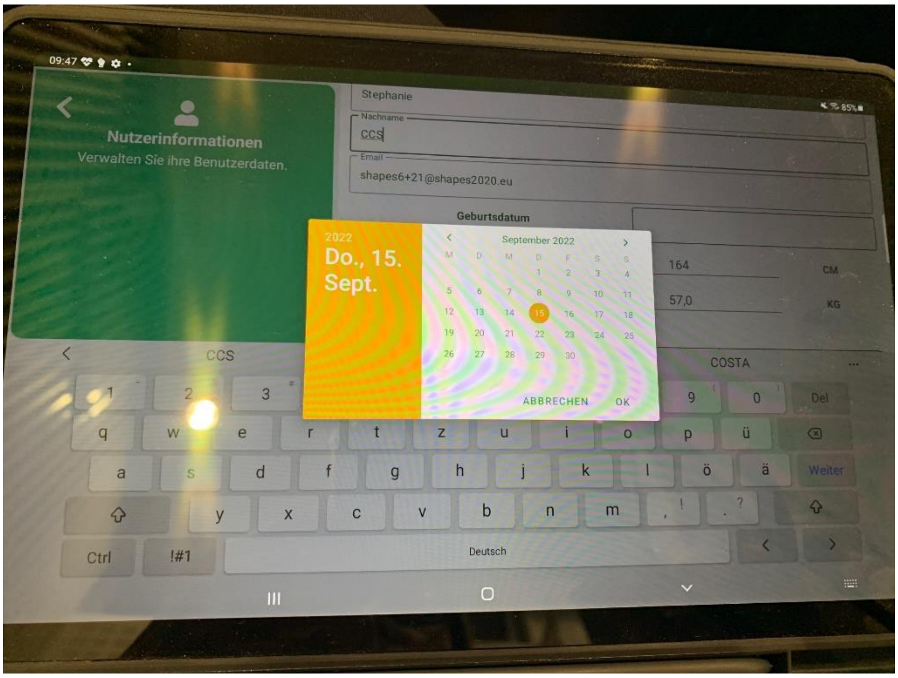

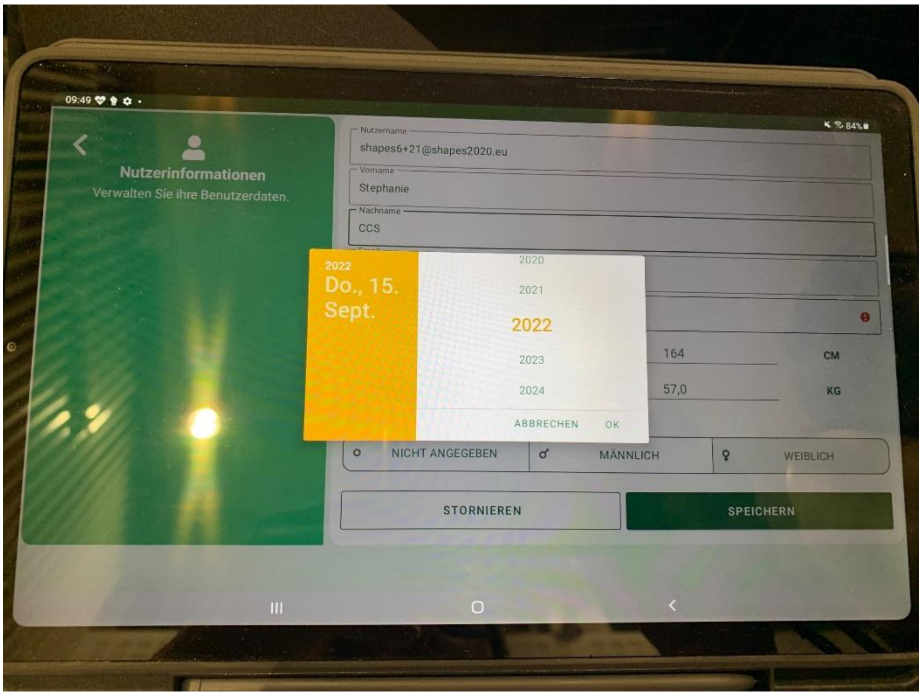

When entering my date of birth, I had some difficulties to adjust the year – it was not clear for me where I have to click to get to it.

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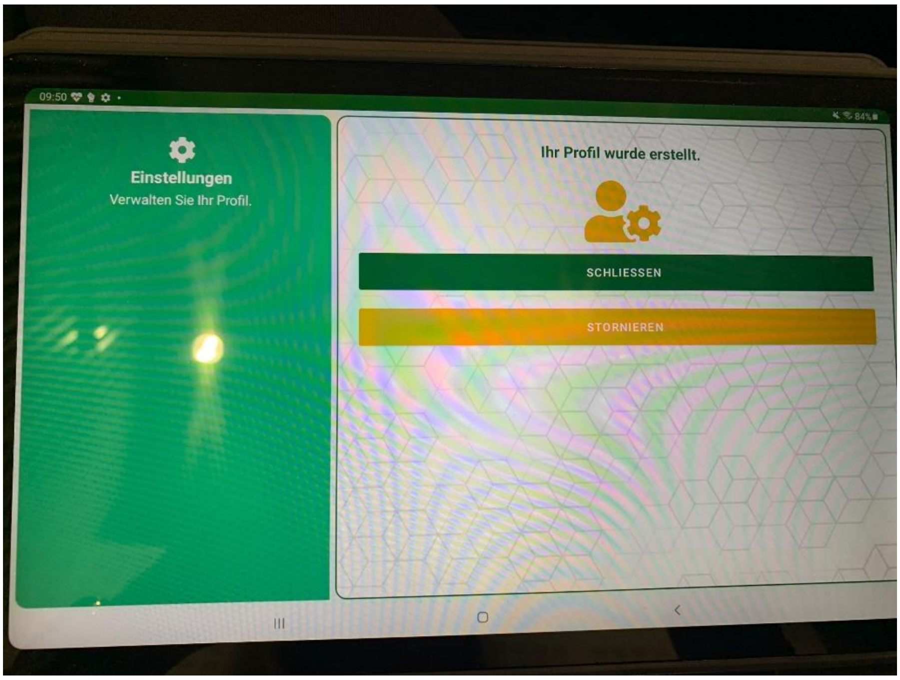

My profil is filled now with real data – just for testing.

3) Pilot 1 – UC001

Phase 4

Feedback Tec Partner 28.09.2022

Feedback on E-Mail:

1- wearable data not fetched automatically: should be auto. please keep checking if this issue still occurs. (could be once or twice per week a manual sync is needed, but most sync should be auto). It could also happen that, since you had a new install, there was a lot of data to sync .... which takes time.

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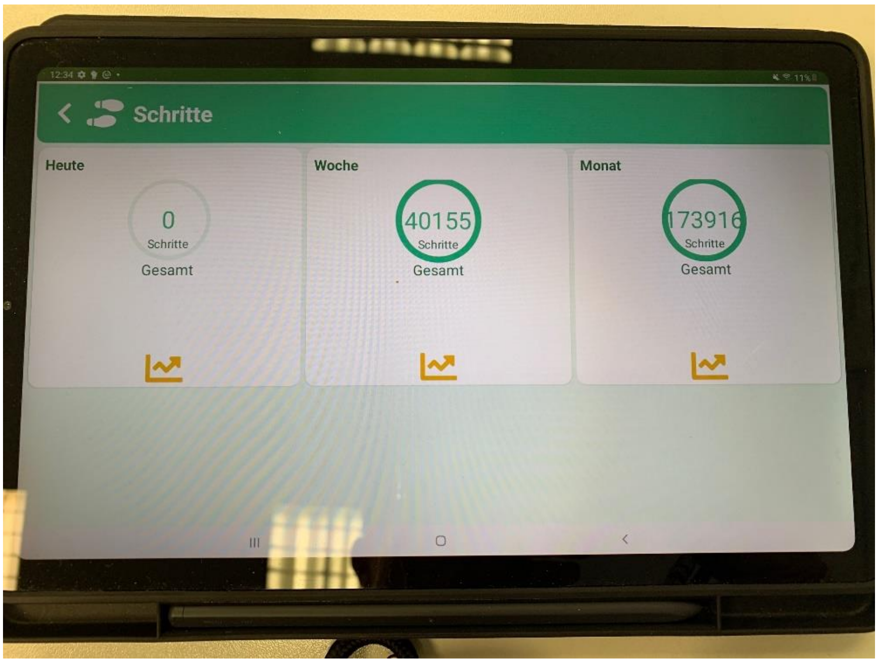

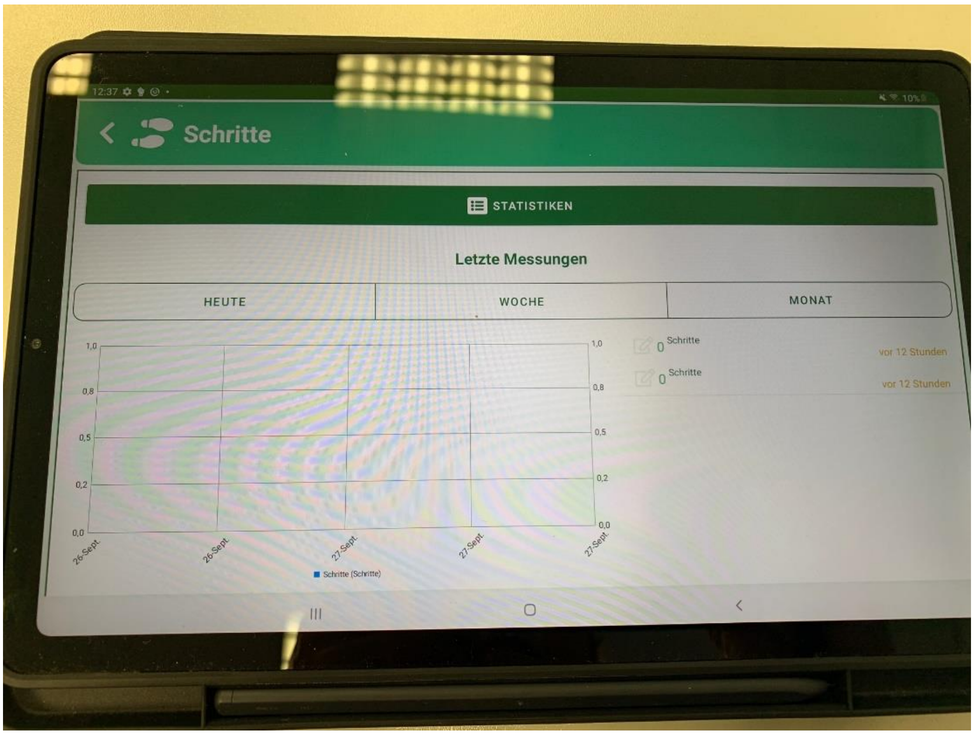

I have tested it again.

When I just log in the Front End App or in eCare there is no up to date data.

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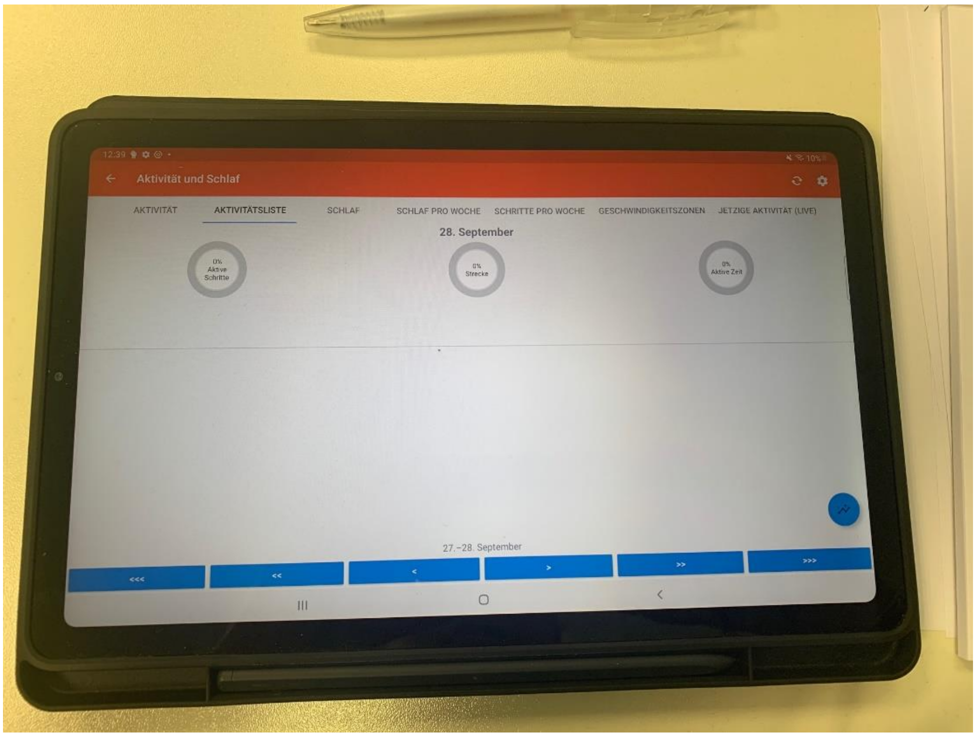
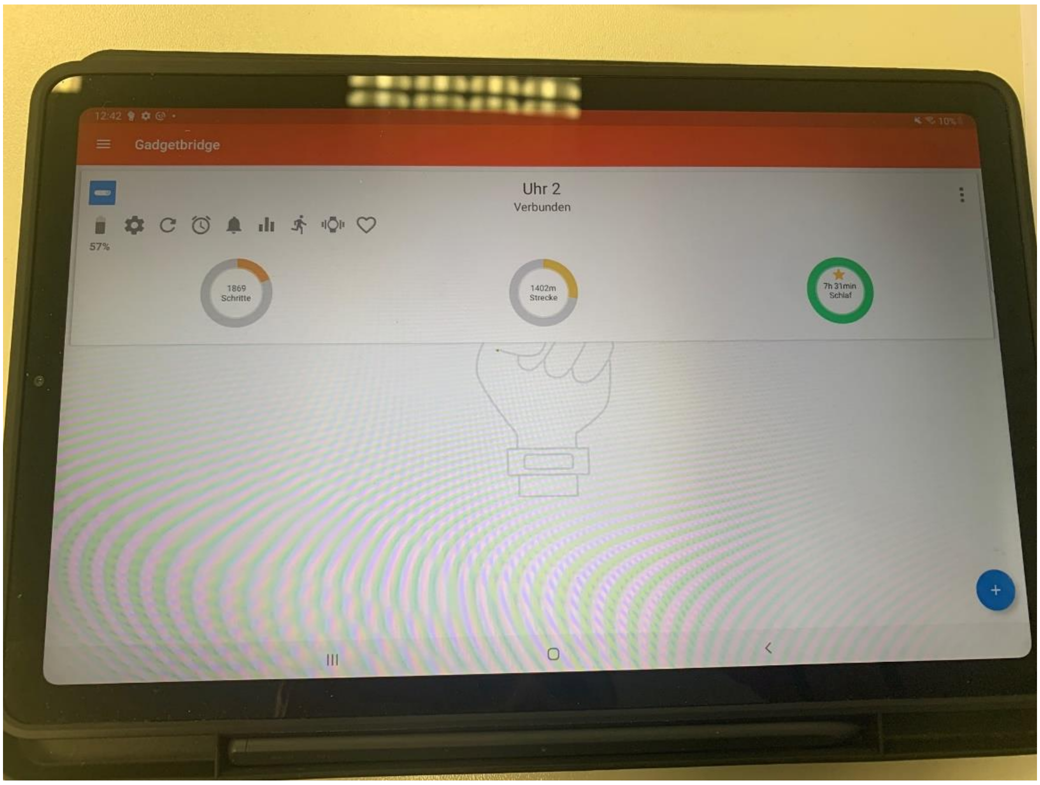
I have to go to Gadgetbridge.

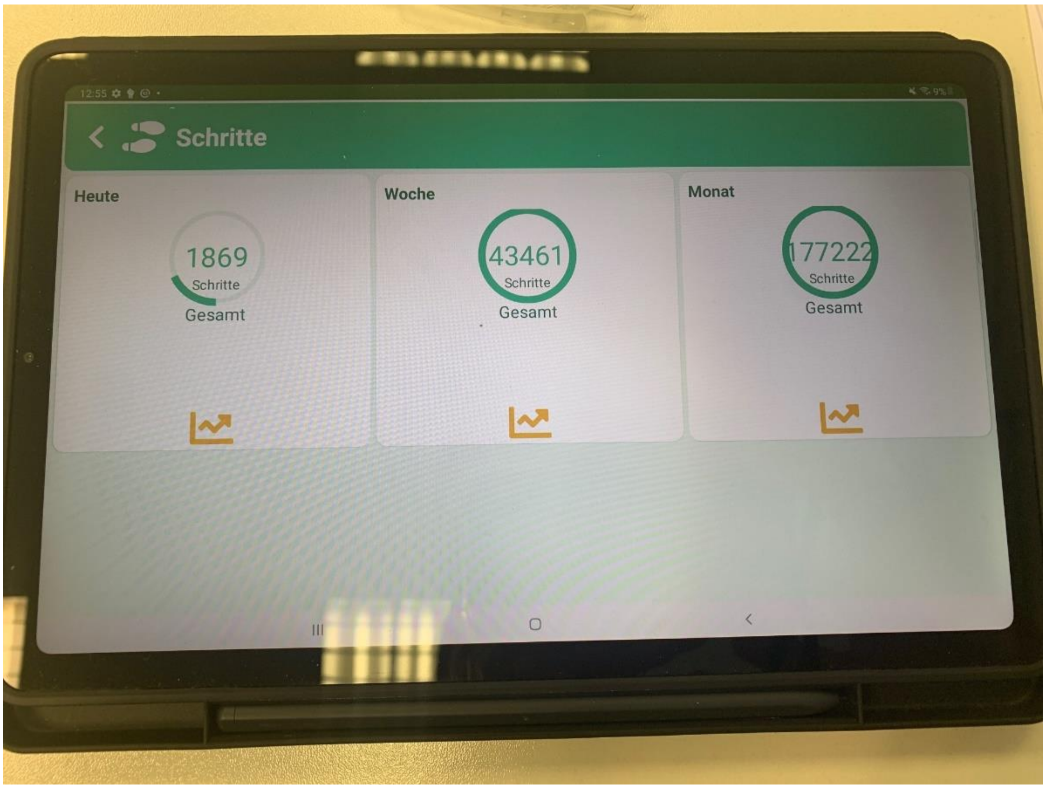


There is also no automatic synchronisation.



I first have to synchronize with the relevant button.

After that, the data is displayed and correct.



After round about 10 minutes the data is automatically displayed in eCare.

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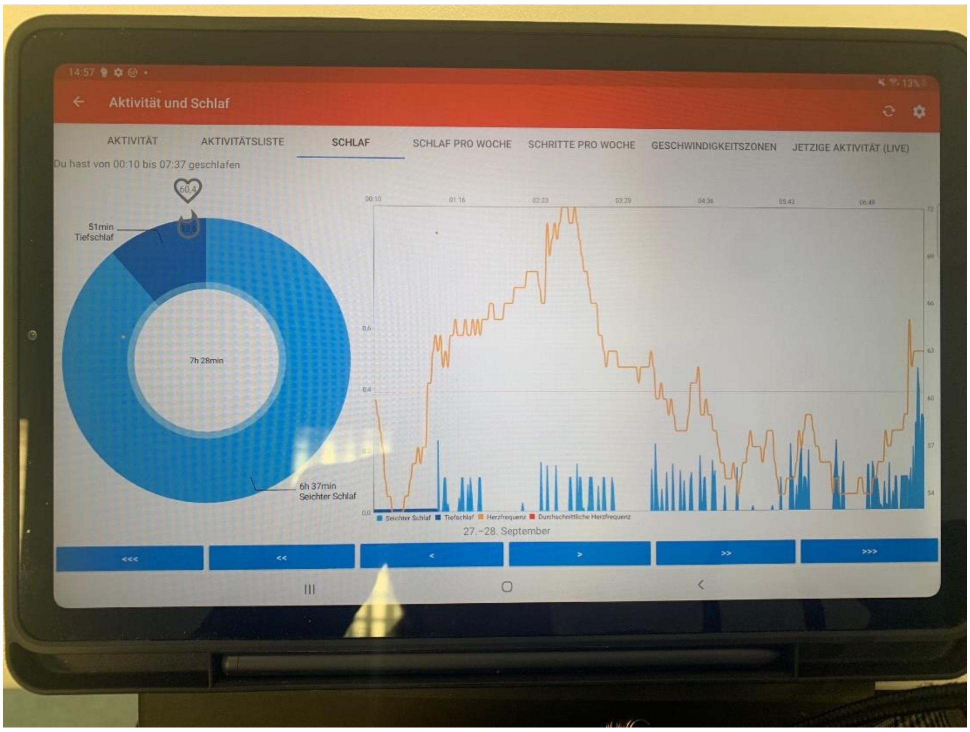
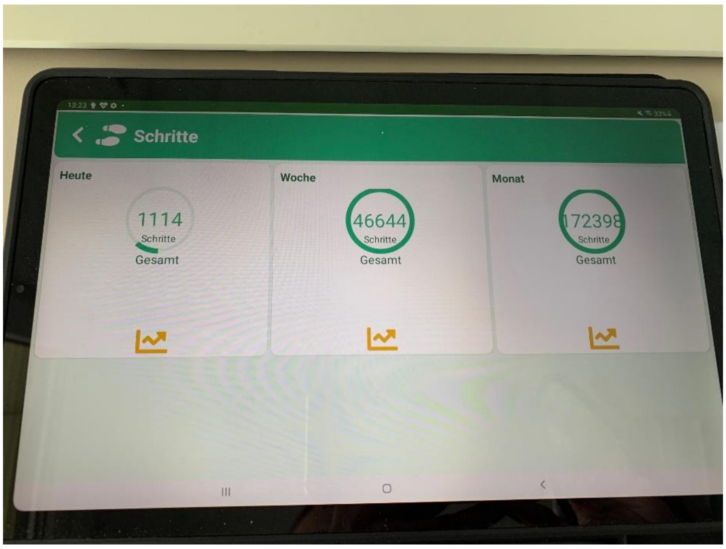
2- sleep data: while we do not have data from TREE, I added a function to retrieve data from the wearable. However, i still see no sleep data. Did you re-install gadgetbridge then eCare ?



That is really strange, because the correct sleep data is in the Gadgetbridge.

I do not update or re-install Gadgetbridge – should I do it?

Another question:



Display yesterday

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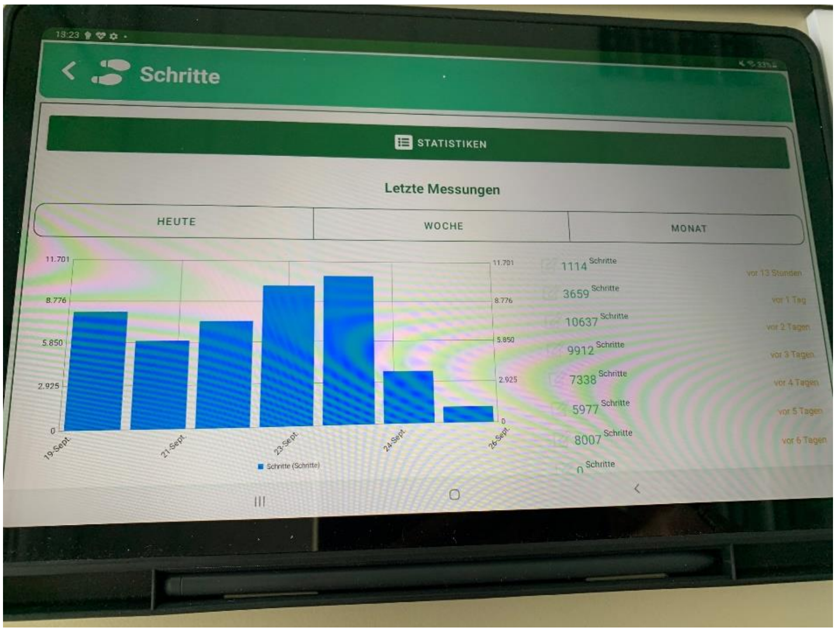
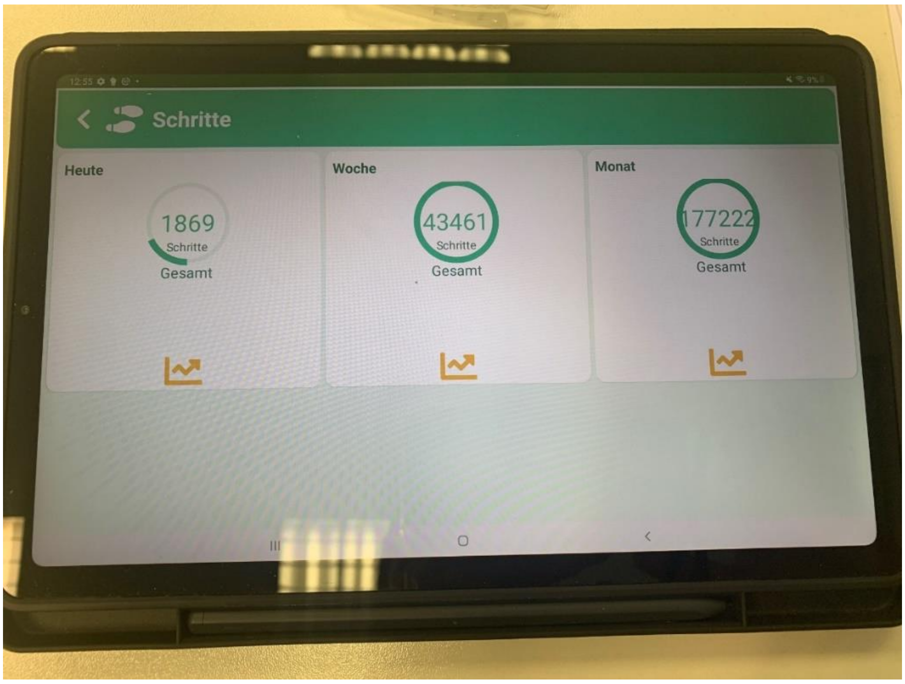


Display yesterday



Display today

How is a week defined?

Always from Monday till Sunday - or always day x (today) minus 6 days?

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I think it would be better if there is a fixed definition of a week, i.e. Monday to Sunday. This would make it easier to compare steps or sleep patterns from week to week.

And the diagram and the list is always Monday till Sunday – so there is no confusing etc.

We certainly have the same issue with months.

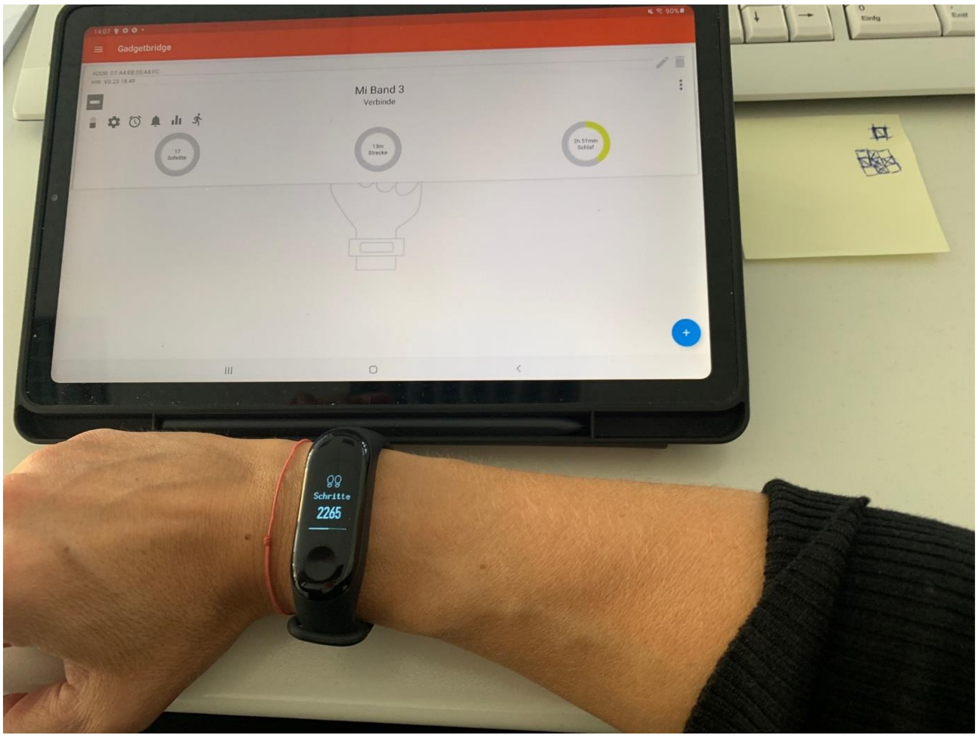
A month - how is that defined?

I think, it would be the best, if it is really the concerning month, i.e. from the first day of the month to the last day of the month – for example 01/month to 30/month.

4) Pilot 1 – UC001 Wellbeing

Test devices and feedback 12.10.2022

<u>Activity/steps:</u>



Something is wrong with the daily steps.

2.265 are on the watch – but there is no data in the gadgetbridge.

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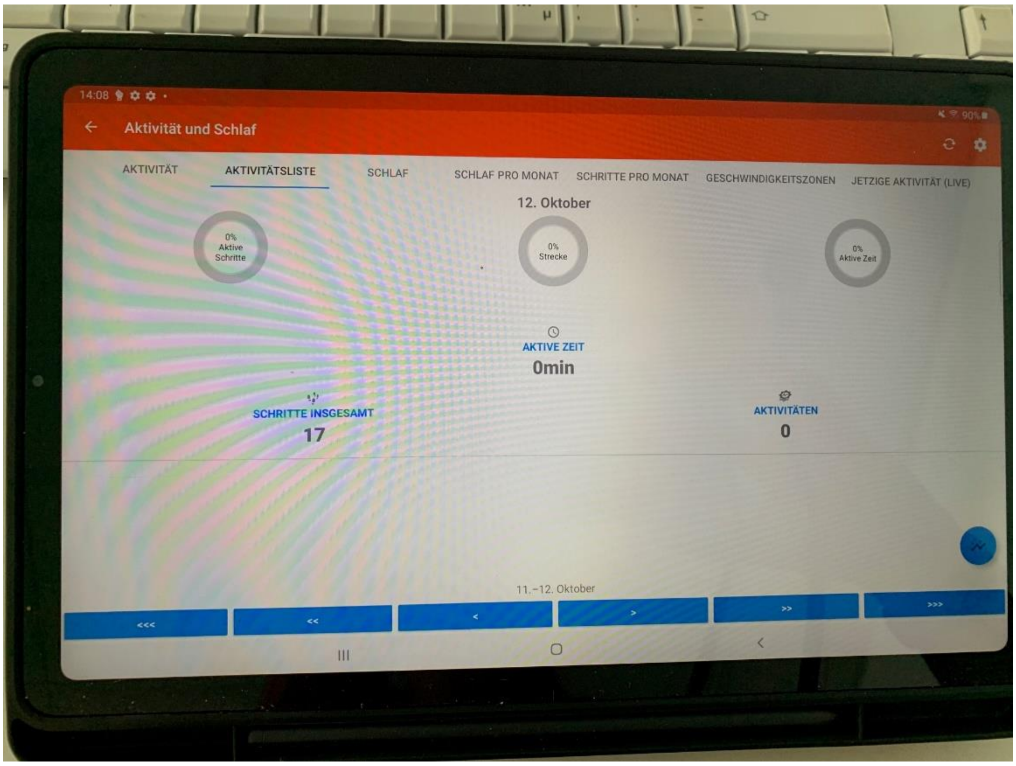

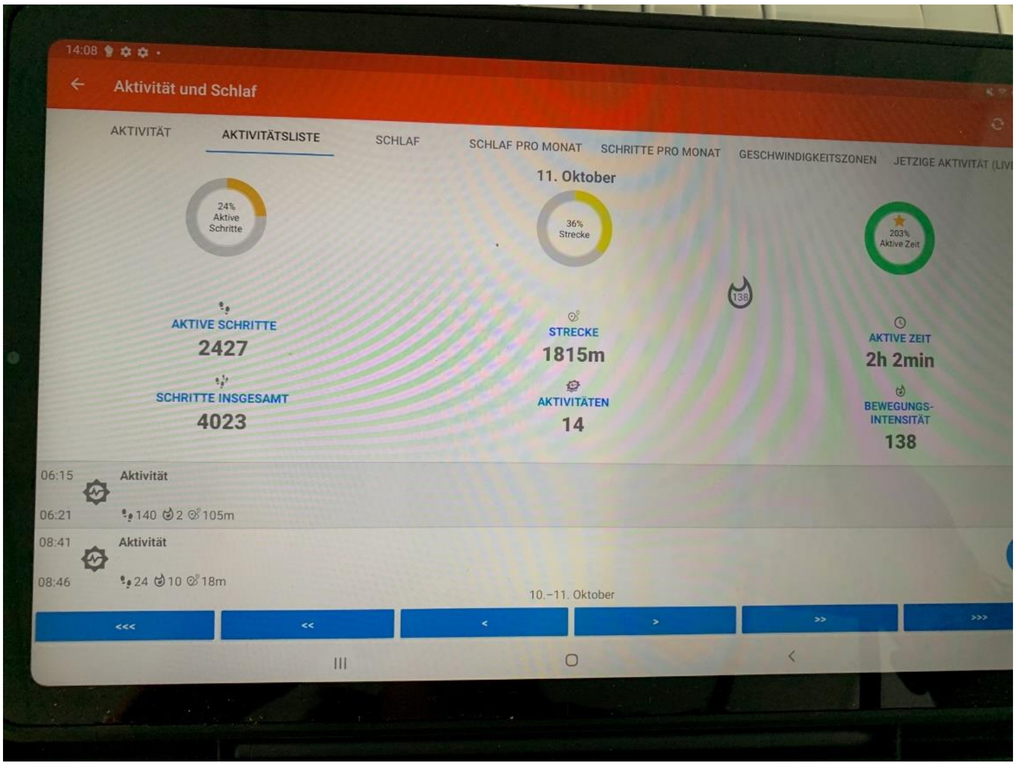

But the steps from yesterday and before are correct in the gadgetbridge.

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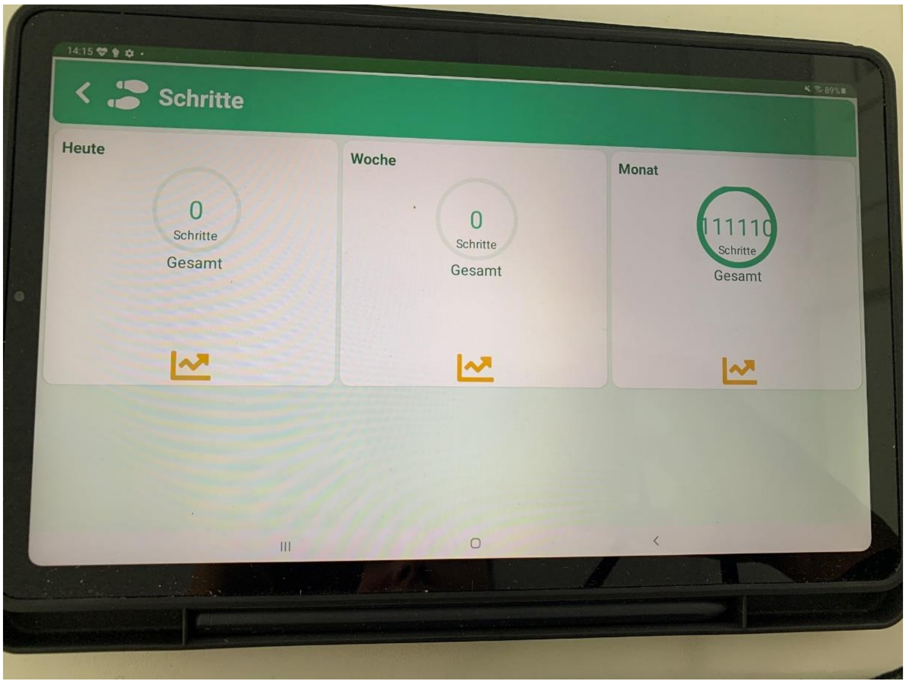

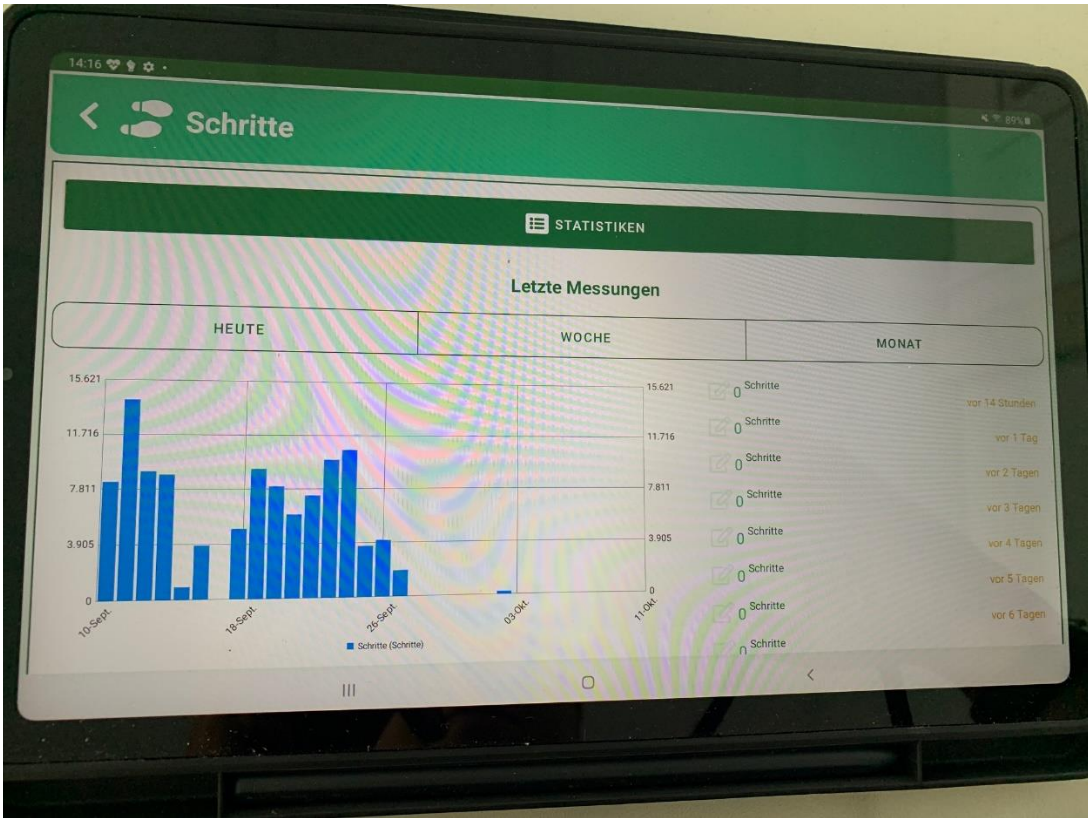

In Ecare are no data from gadgetbridge – just the data before I reinstall gadgetbridge and reconnect the MiBand.

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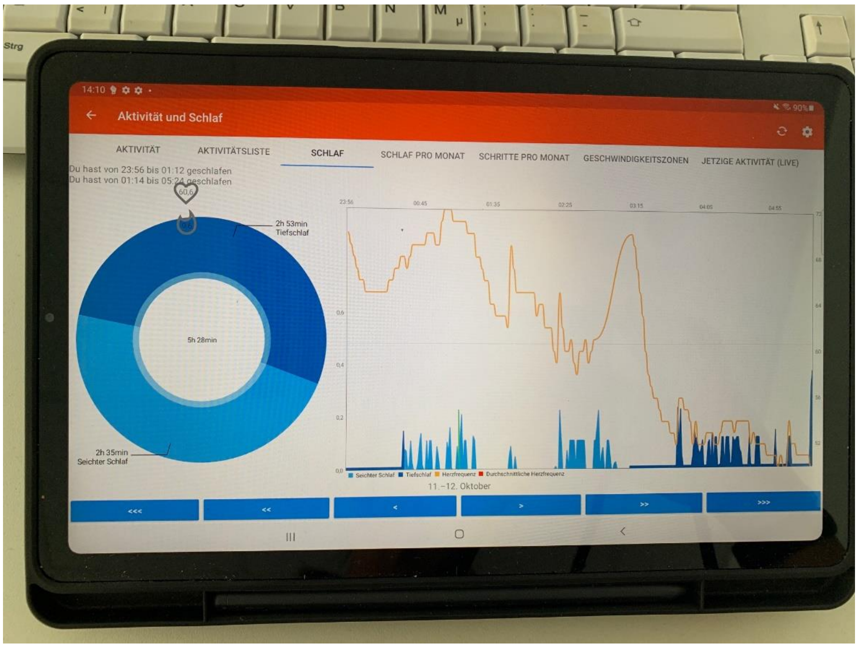
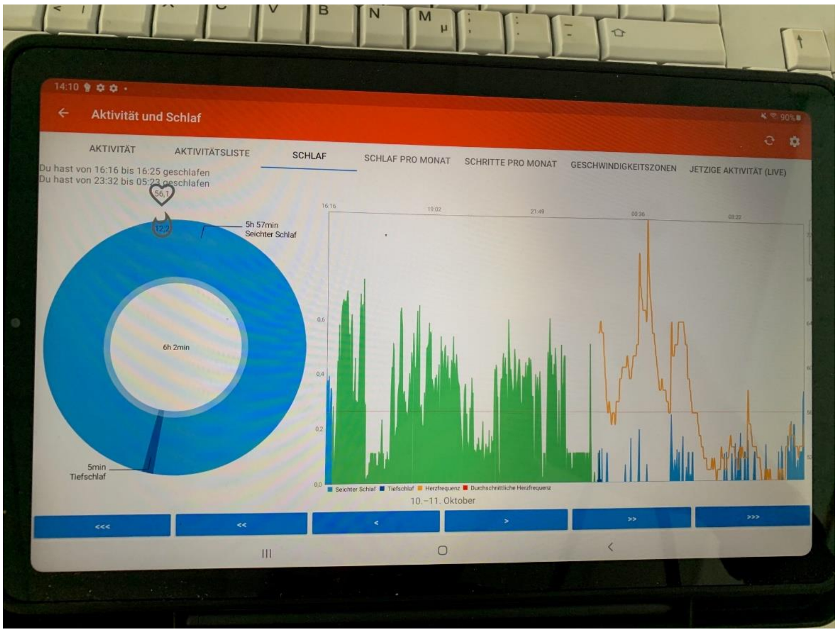
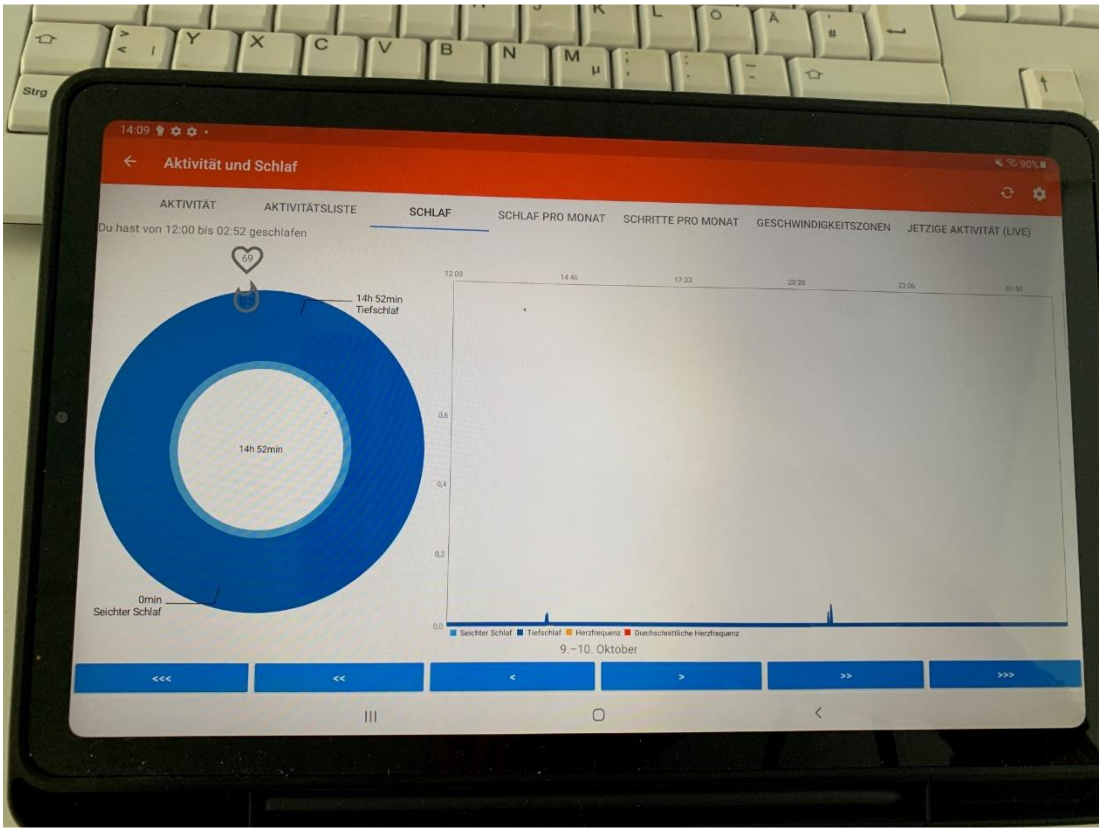
<u>Sleep:</u>

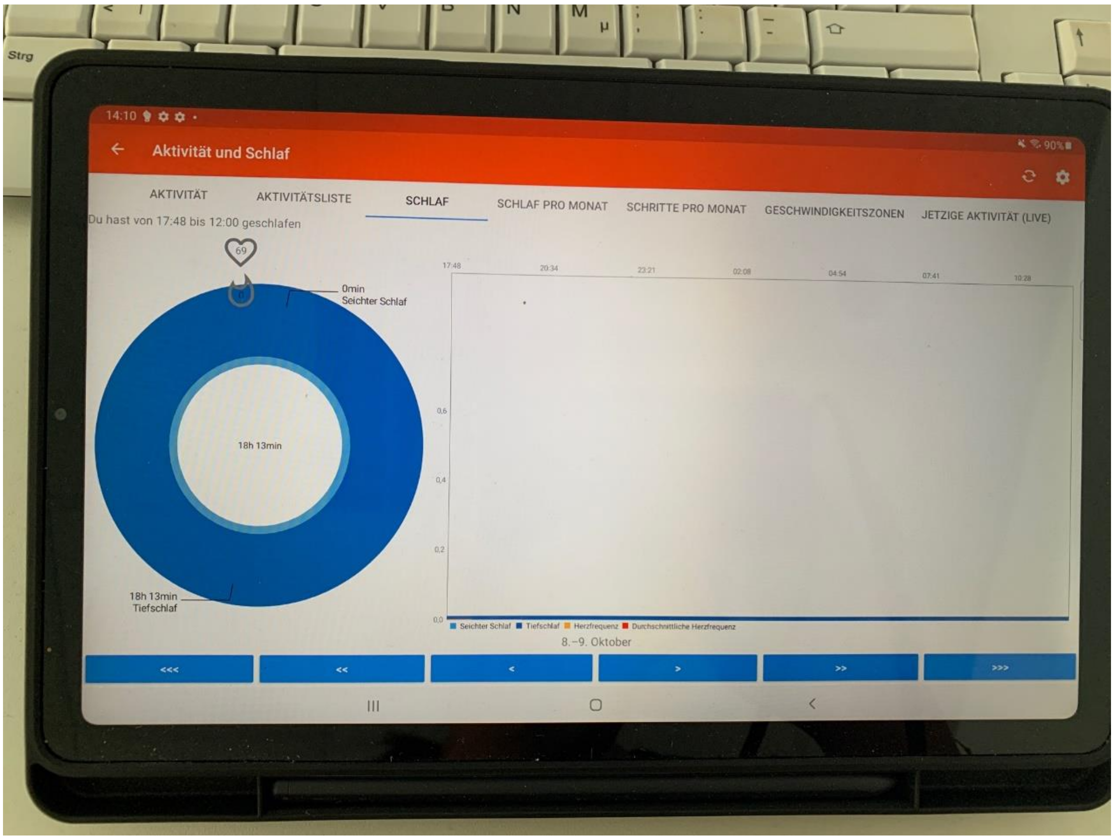


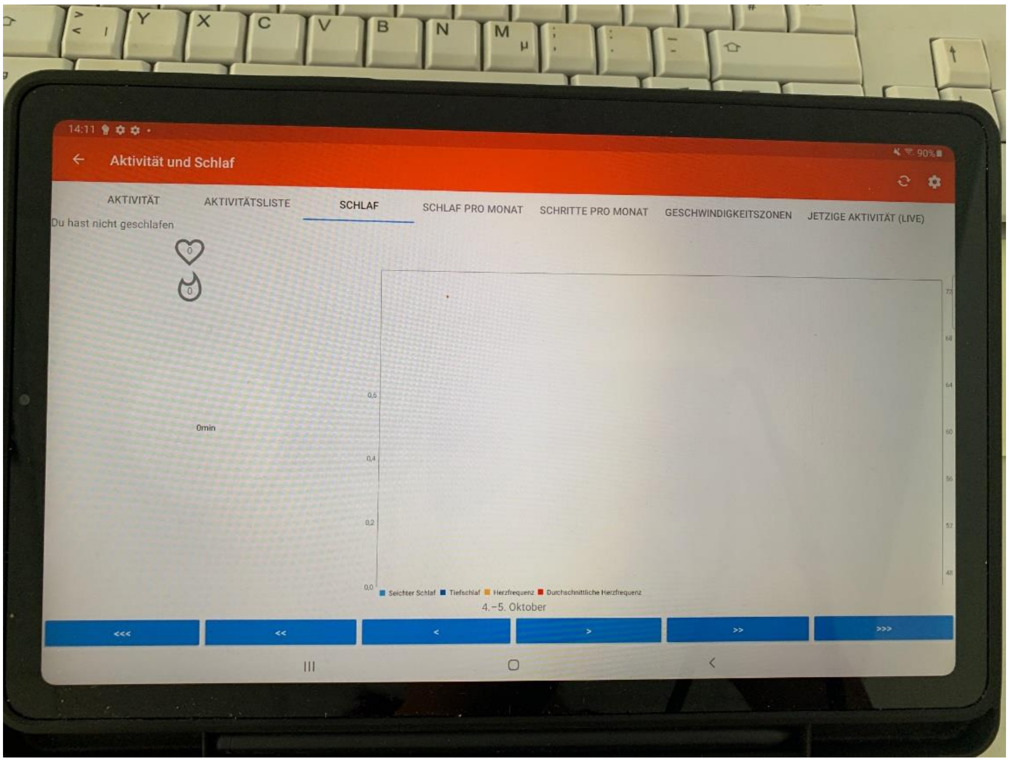
Sleep data is correct in gadgetbridge.



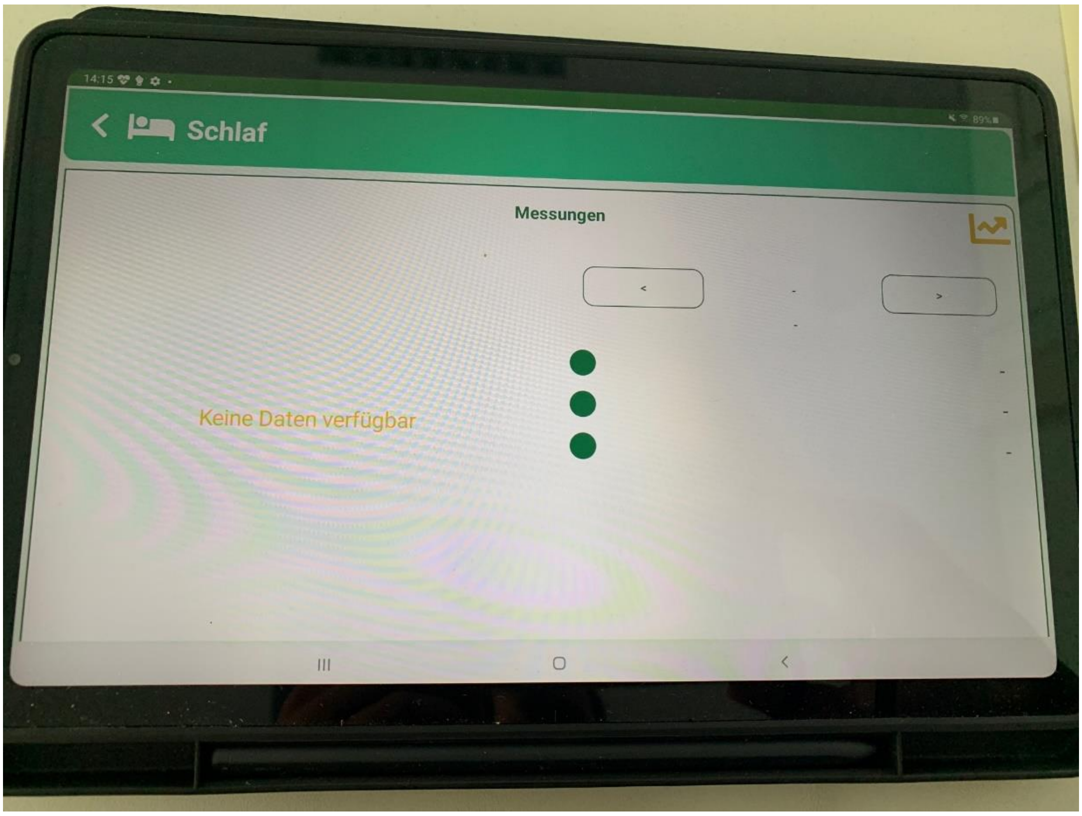


That is a little bit strange, because I do not wear the watch on Saturday, 08.10.2022 and on Sunday, 09.10.2022.





From this date back are no data in gadgetbridge because of the reconnect the MiBand.



There are no sleep data in Ecare.

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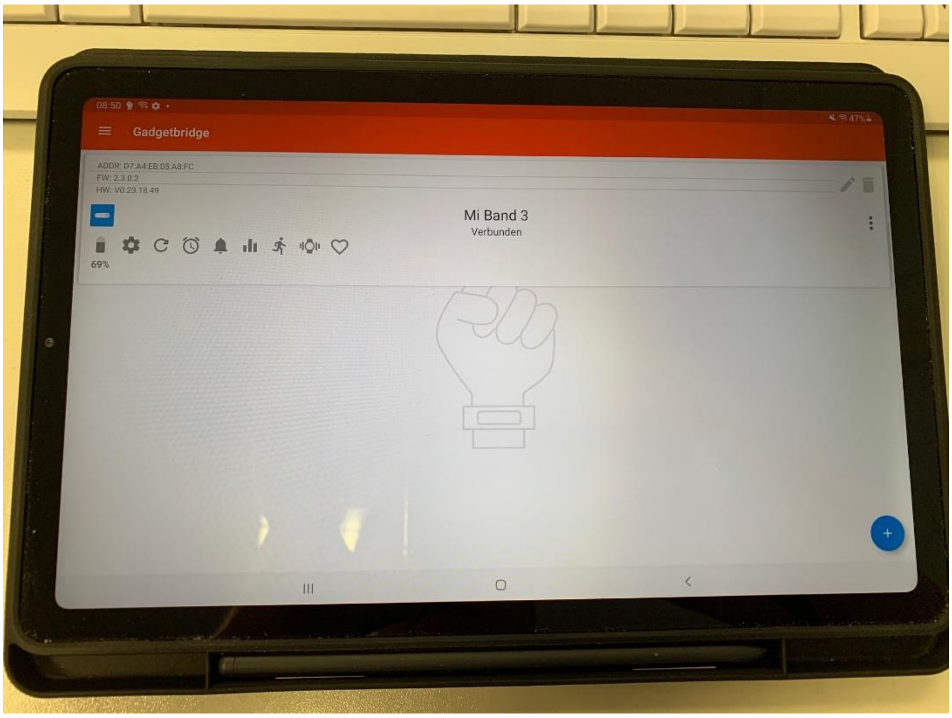
5) SHAPES Pilot 1 – UC001

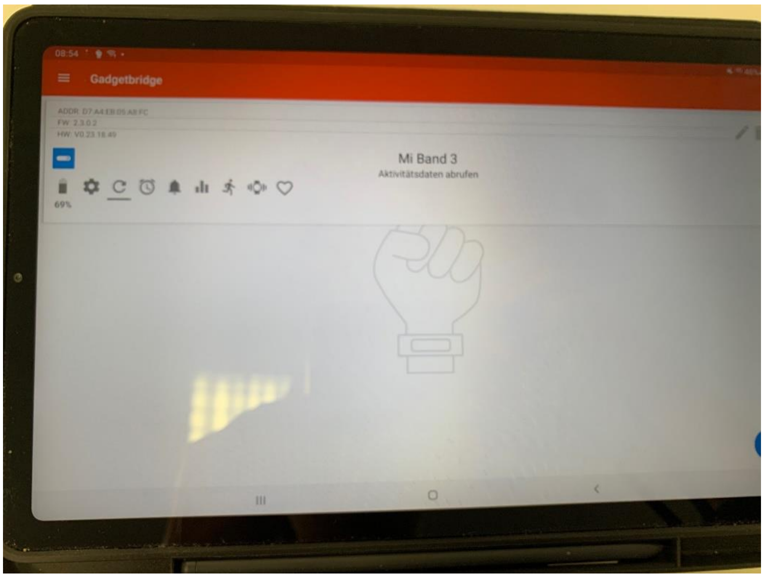
Phase 4

Feedback Tec Partner 17.10.2022

Synchronisation:



It is connected.



I have to click on the button to synchronise the data.

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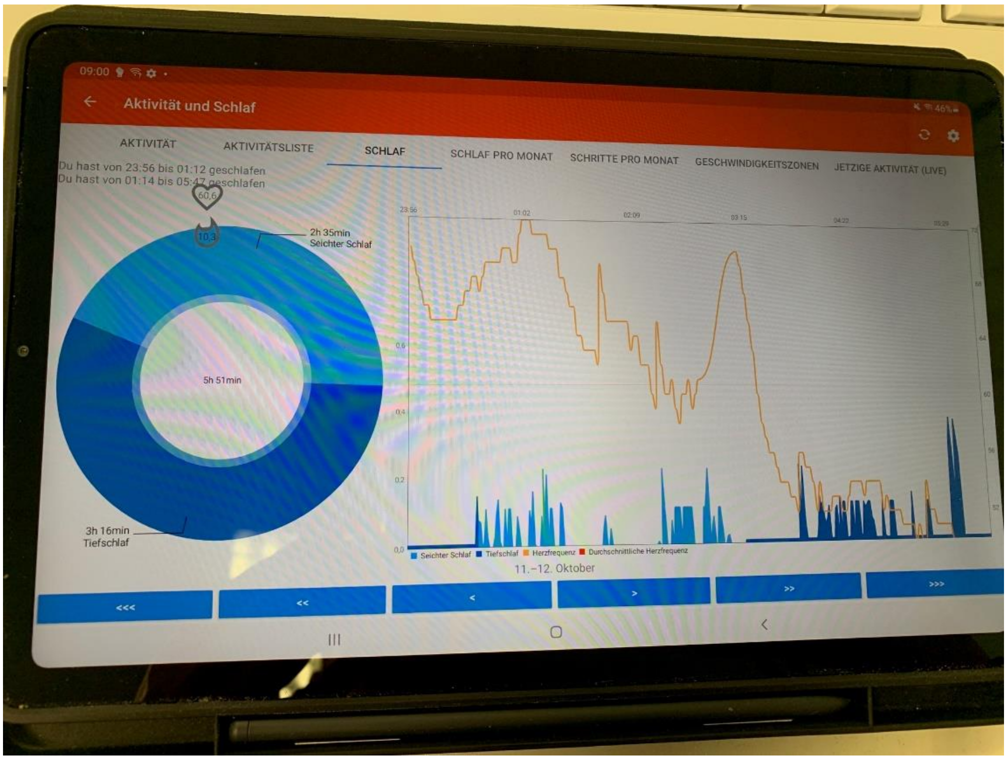
Sleep:

Data is correct



Data is correct

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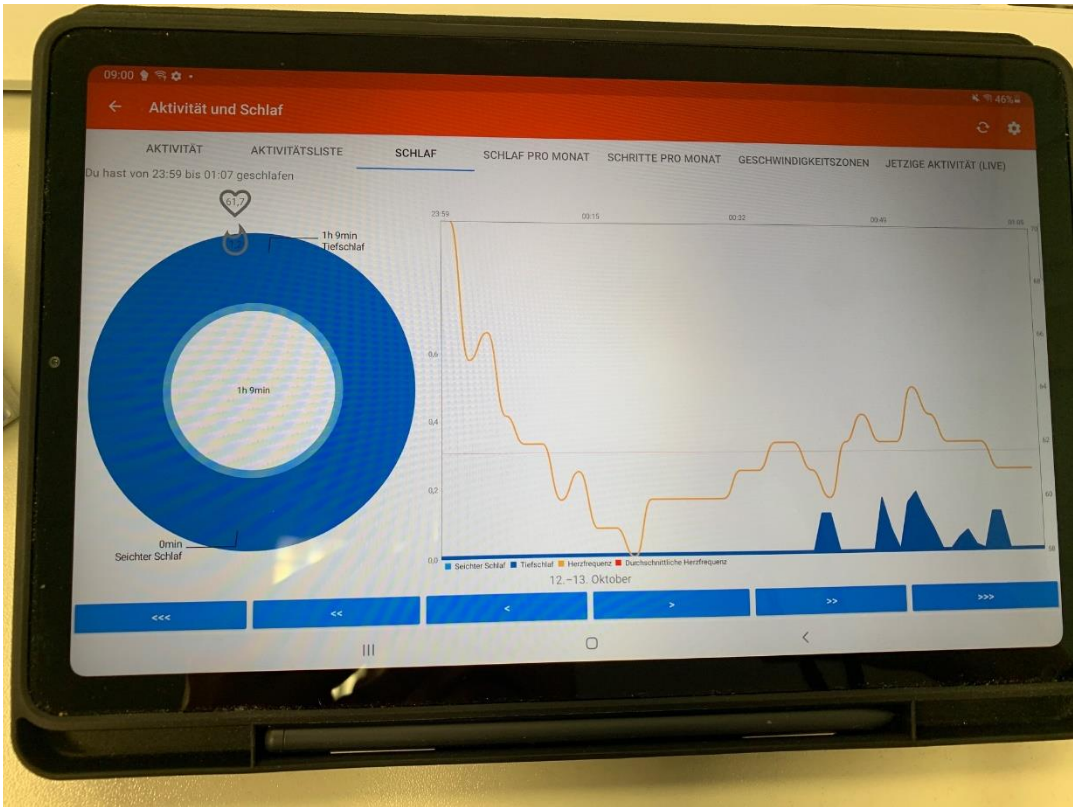
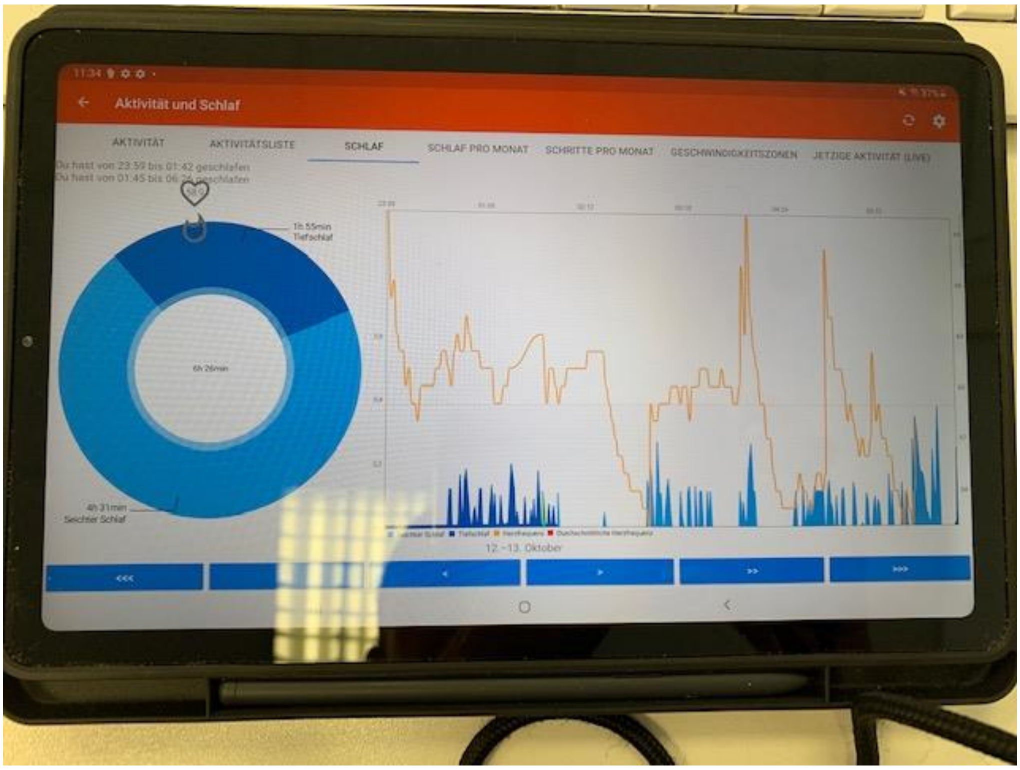


Same issue as steps – no data or not correct data



Only after a few rounds of synchronisation the data is correct.

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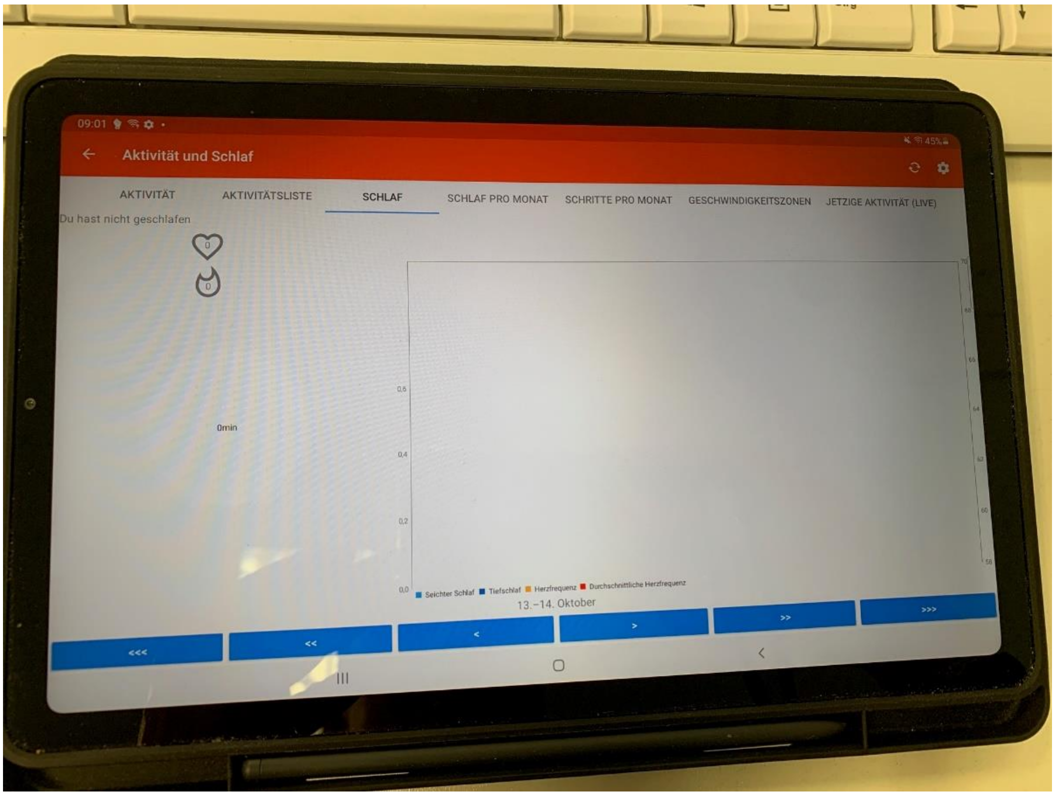
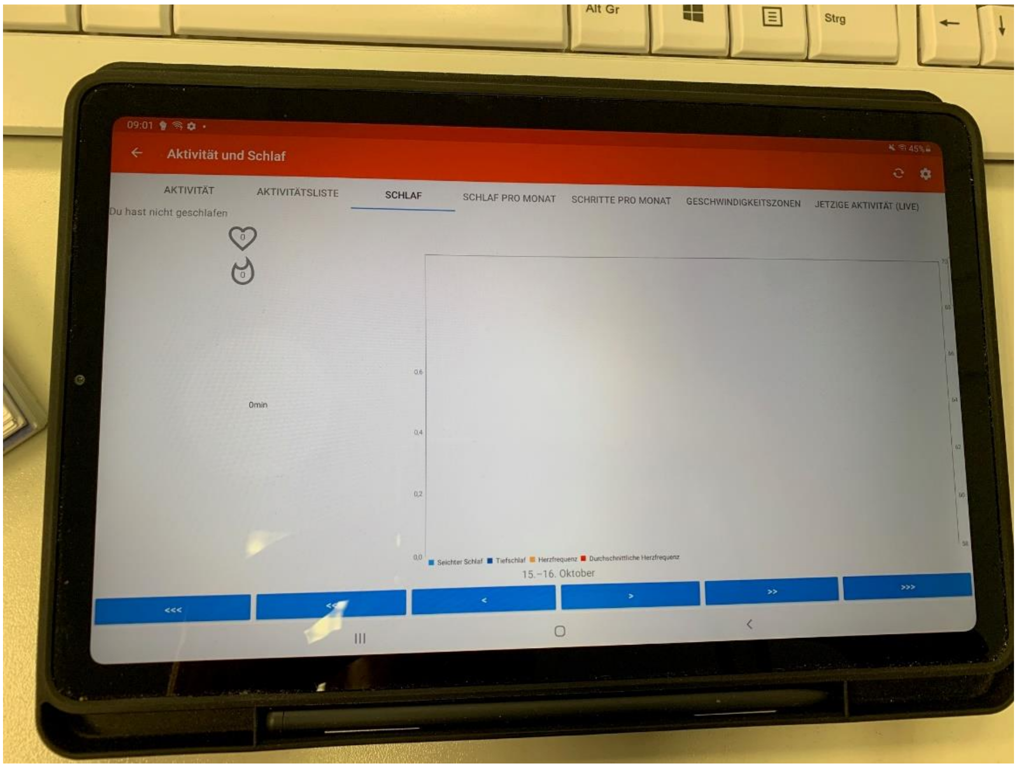
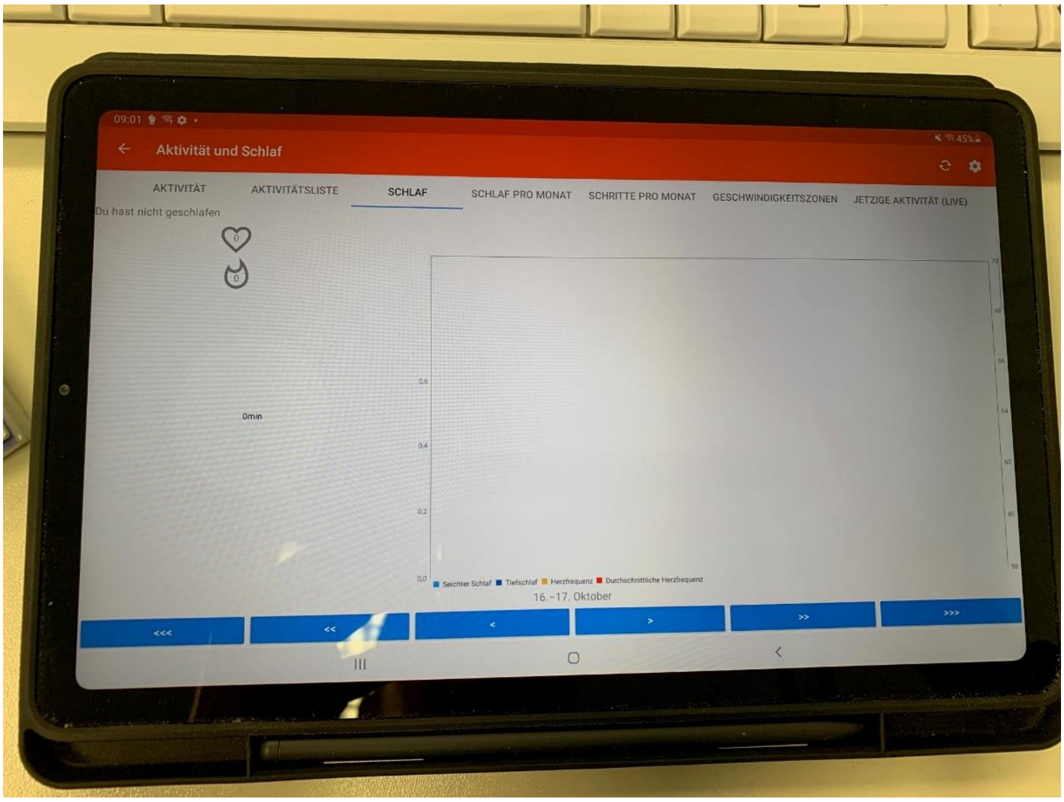
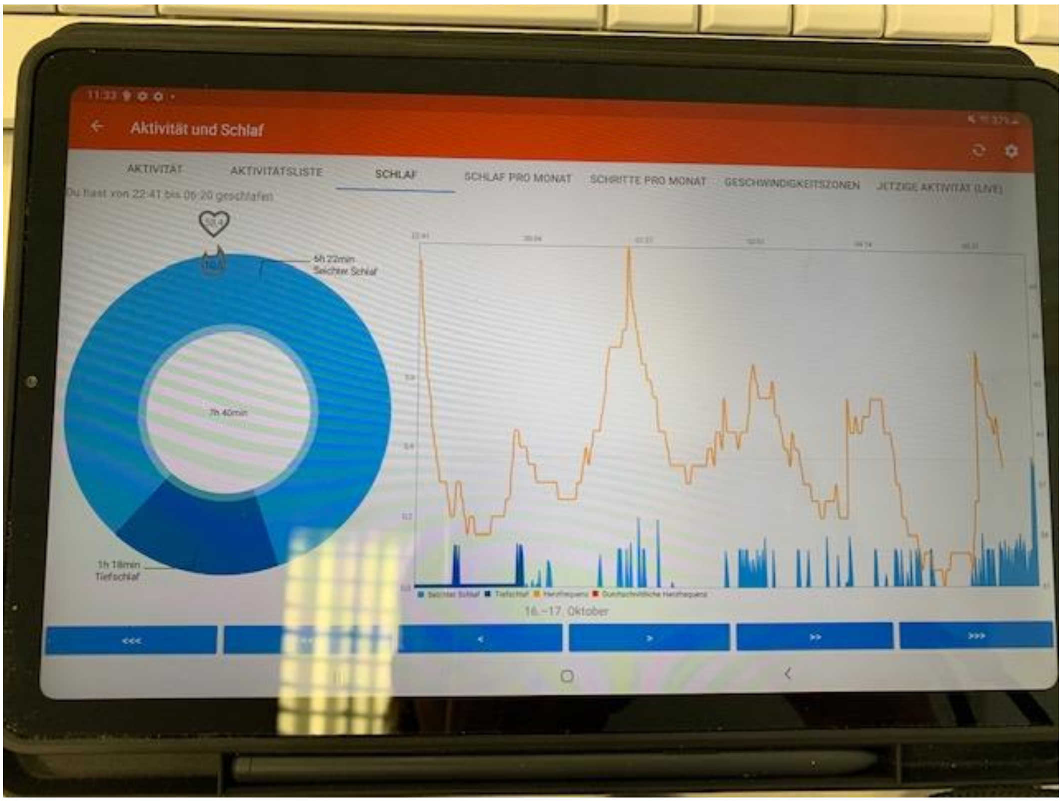


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159





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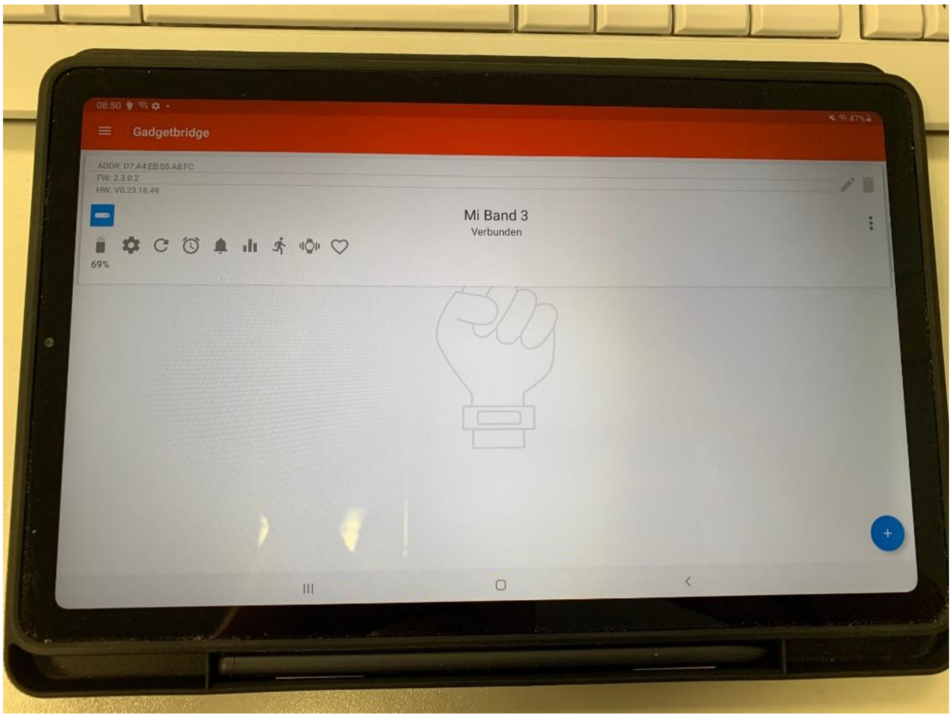
6) SHAPES Pilot 1 – UC001

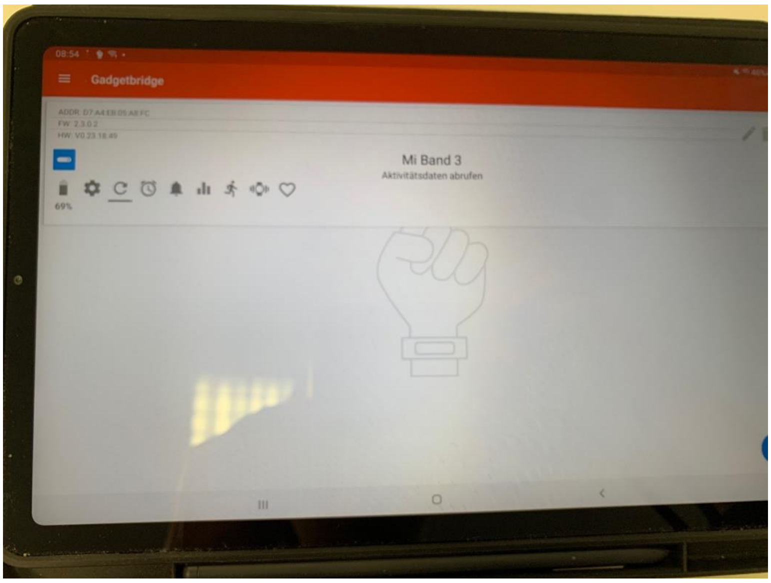
Phase 4

Feedback Tec Partner 17.10.2022

<u>Synchronisation:</u>



It is connected.



I have to click on the button to synchronise the data.

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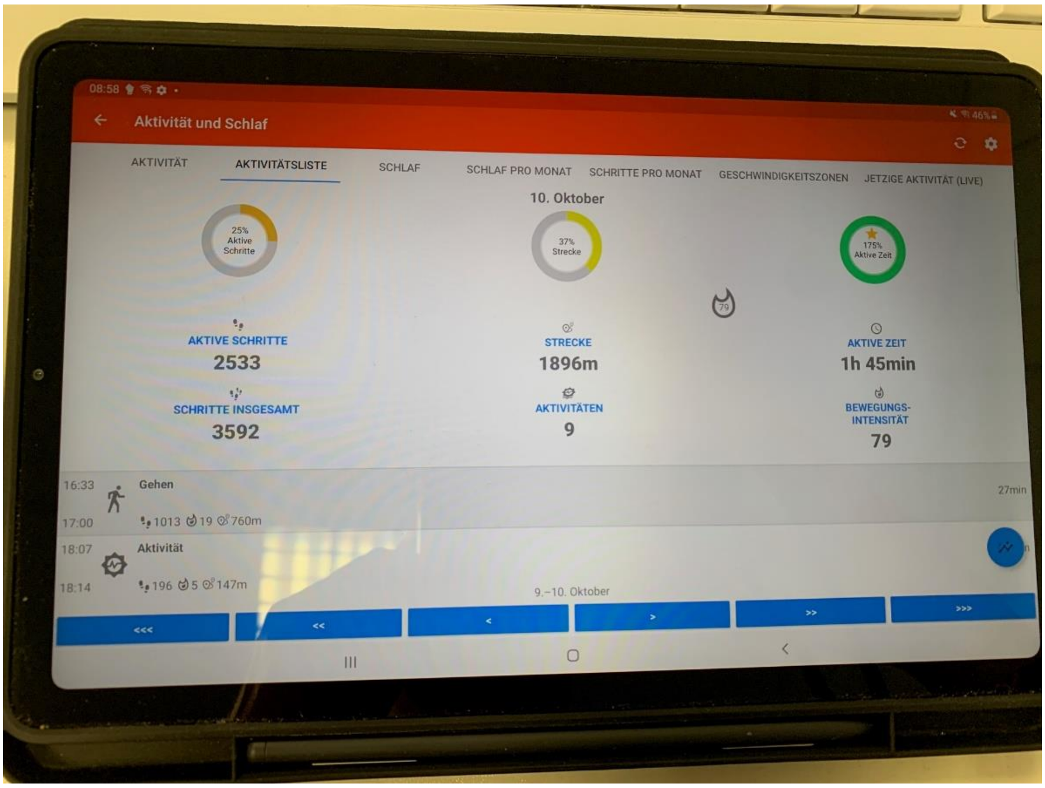
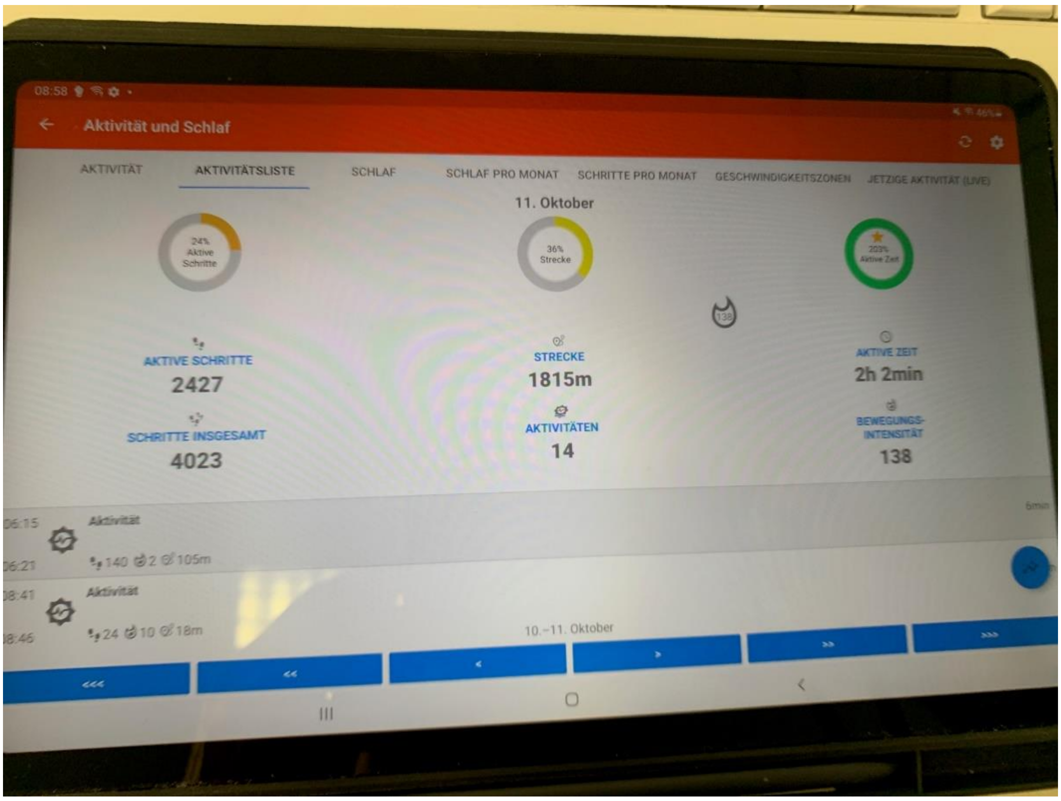
Steps:



Data is correct



Data is correct

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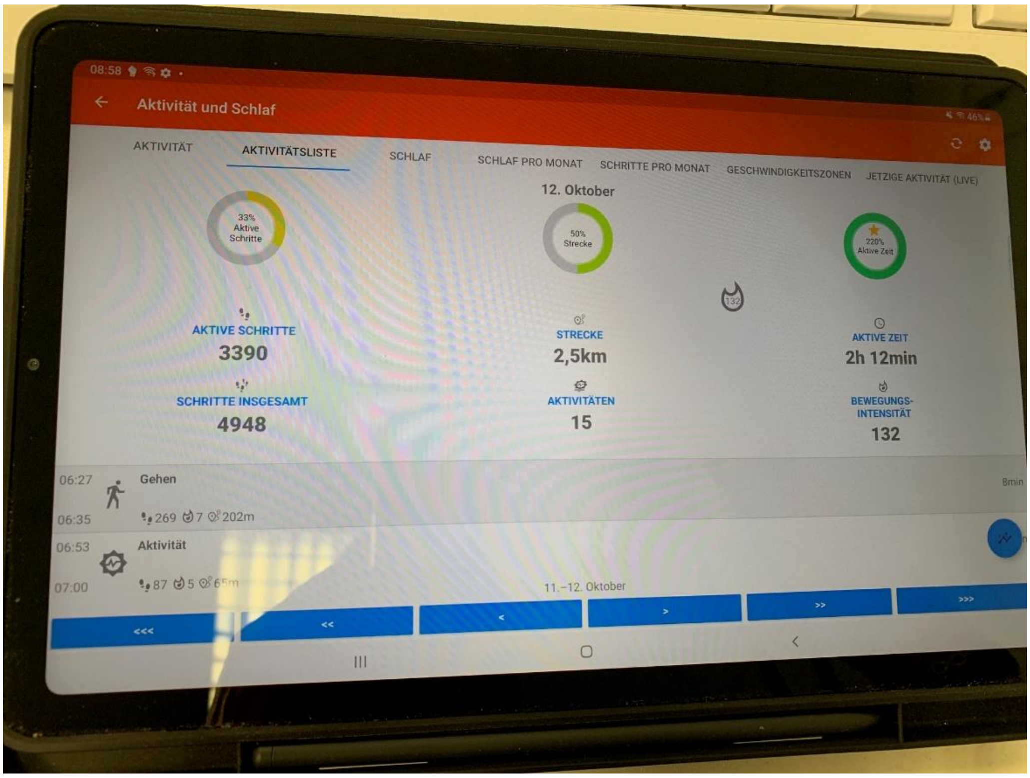
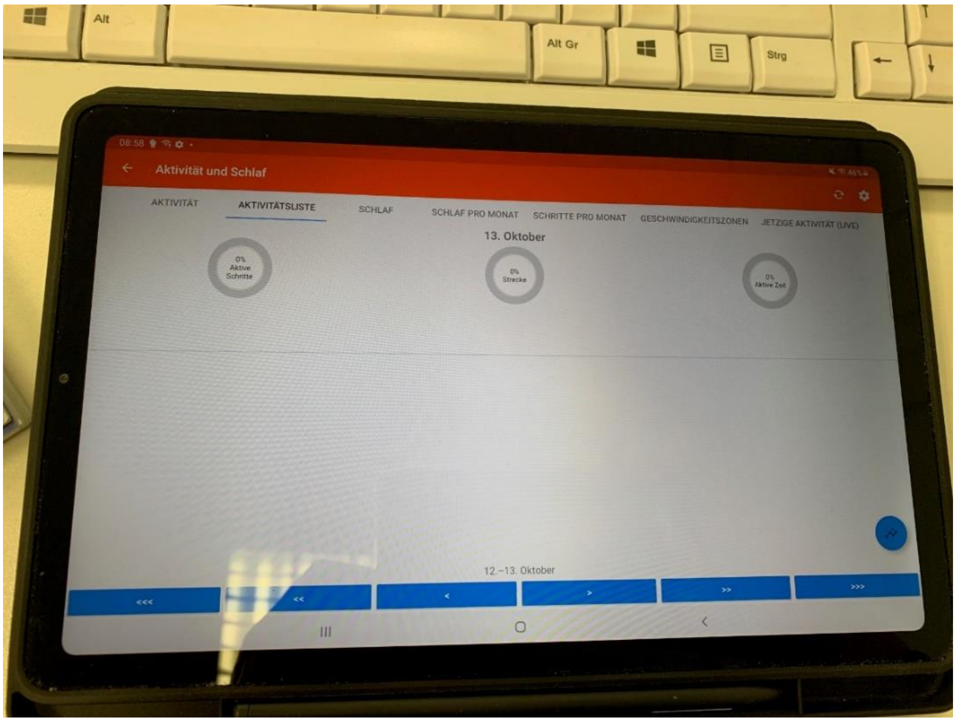


Data is correct



That is a little bit strange. There is no data the next days.

I have synchronised the data every 10 minutes (around) about 3 hours – and it seems that the data "come very slowly" to the system or that with every synchronisation only

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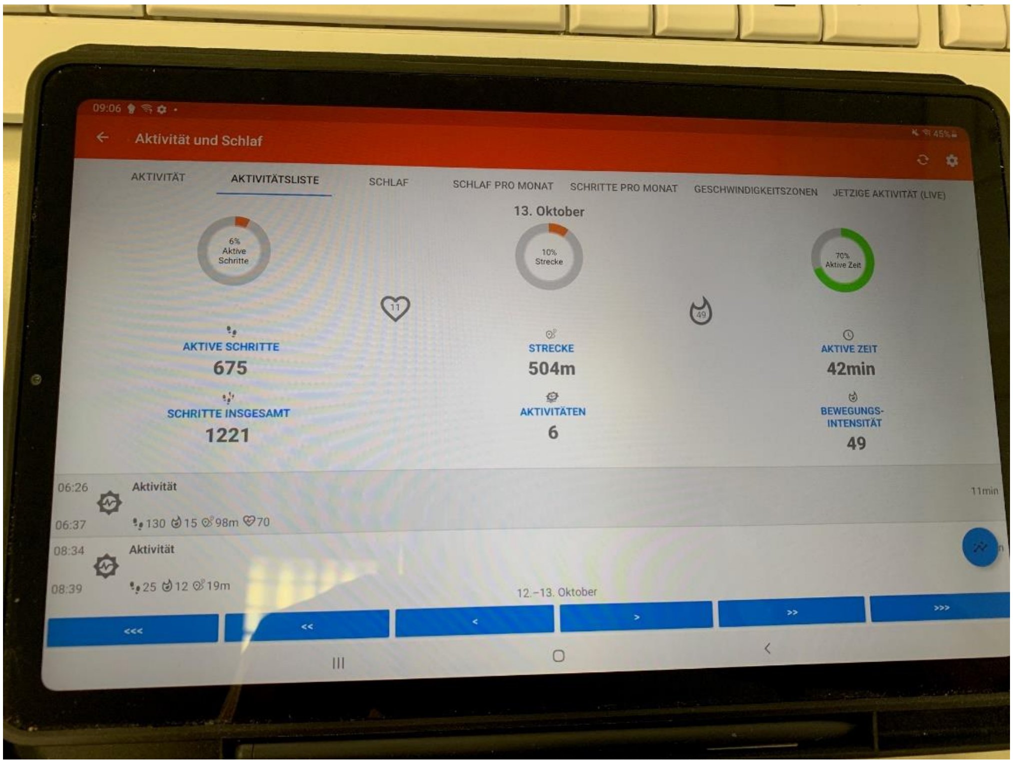
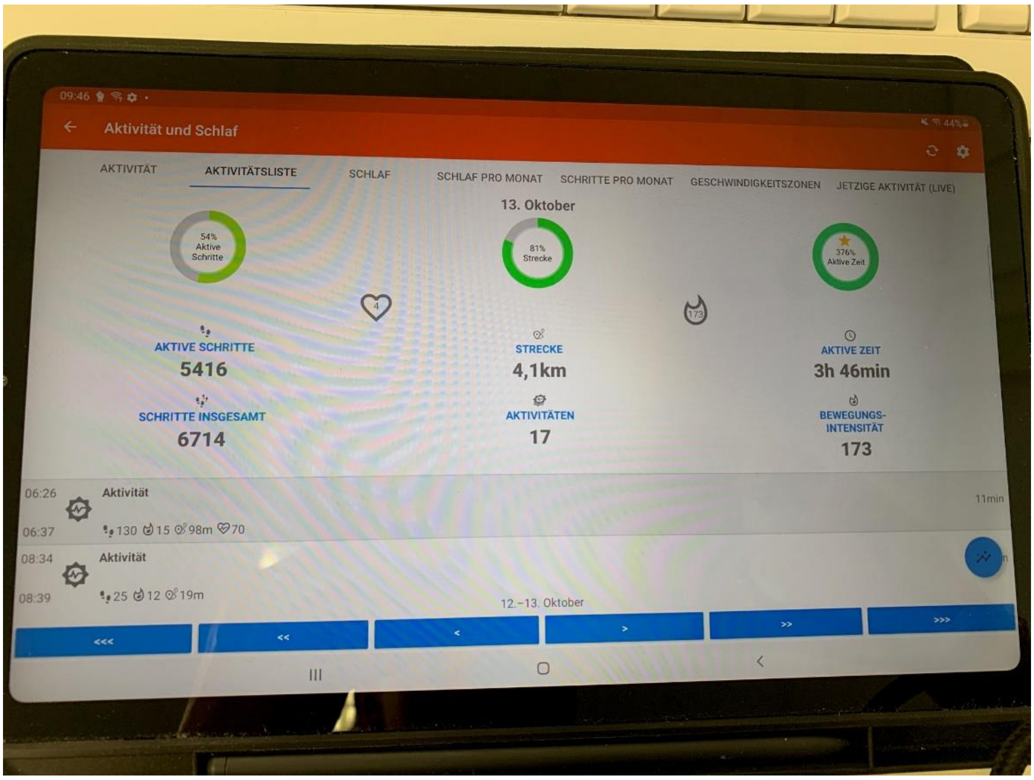
some data comes to the system and not all data??? I really do not understand this…furthermore before reconnecting the fitness tracker, this worked much better

Maybe you have an idea?





Now the data is correct.

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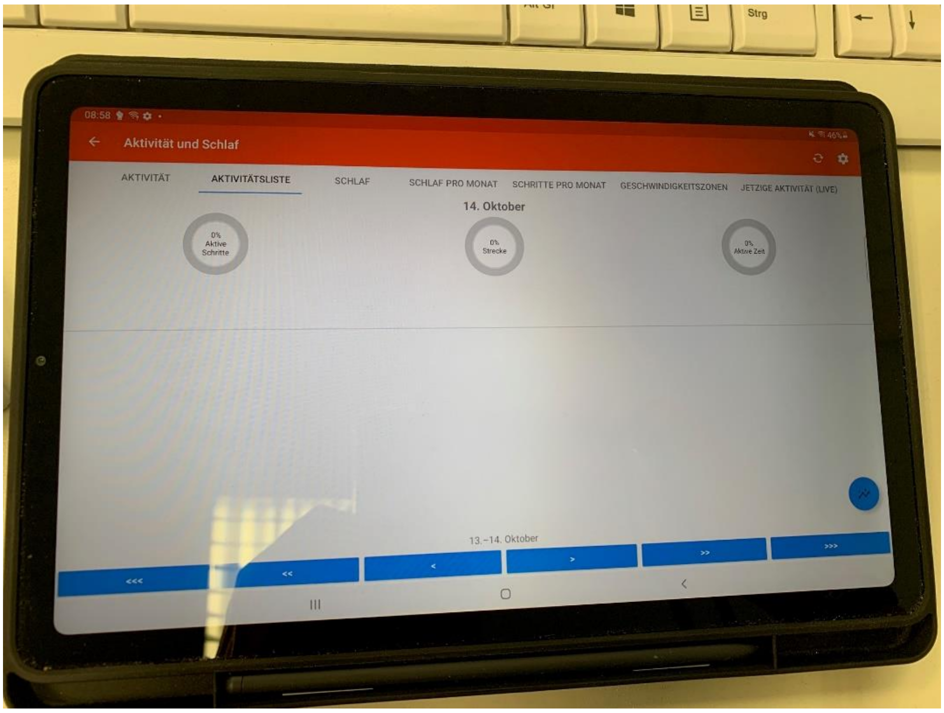

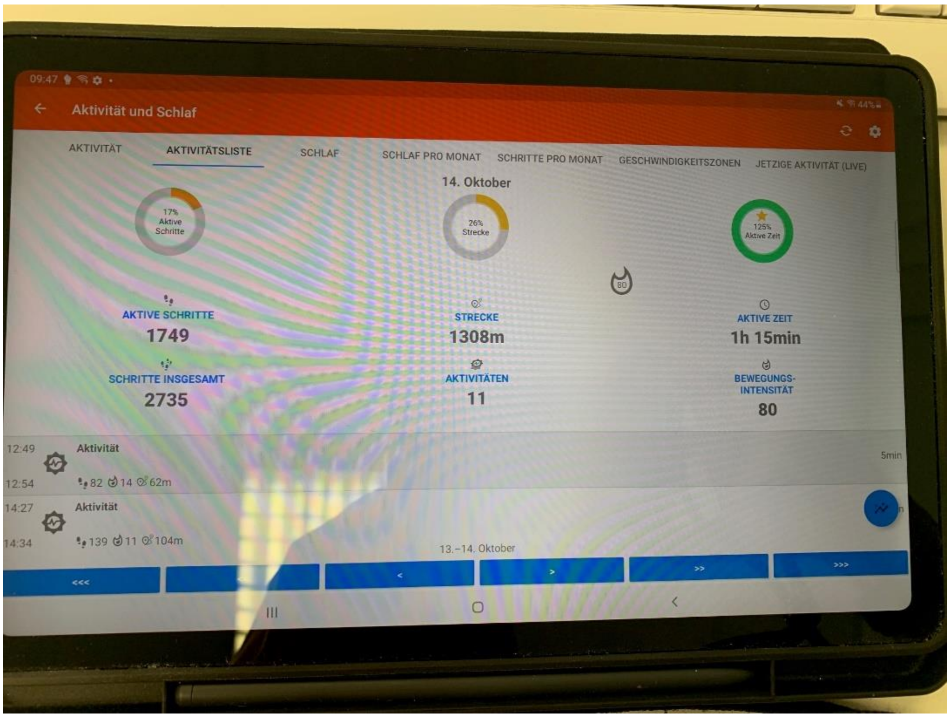

Now the data is correct.

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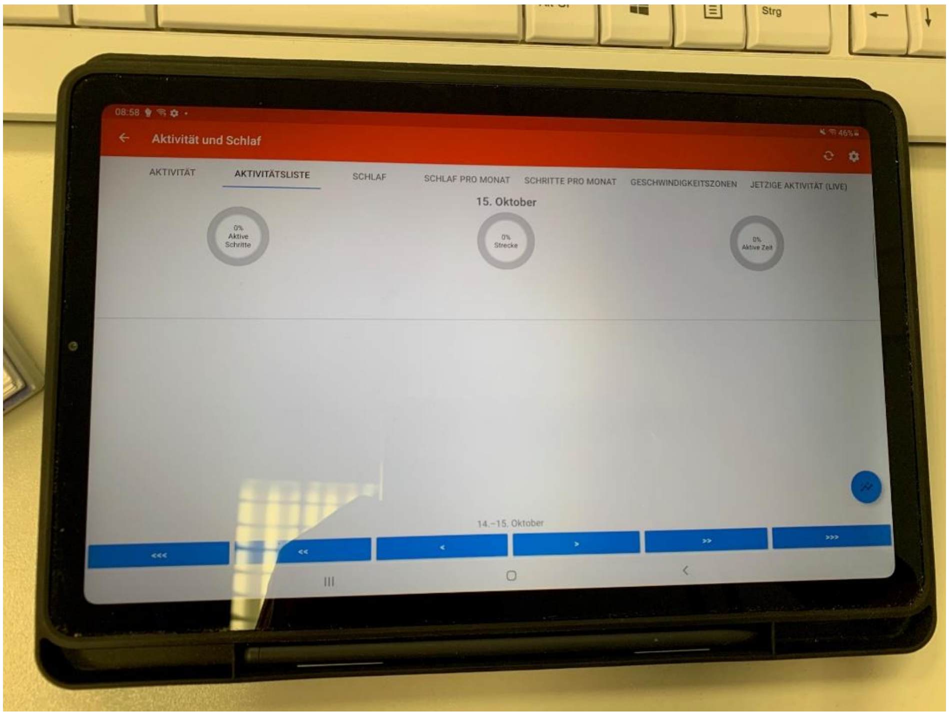
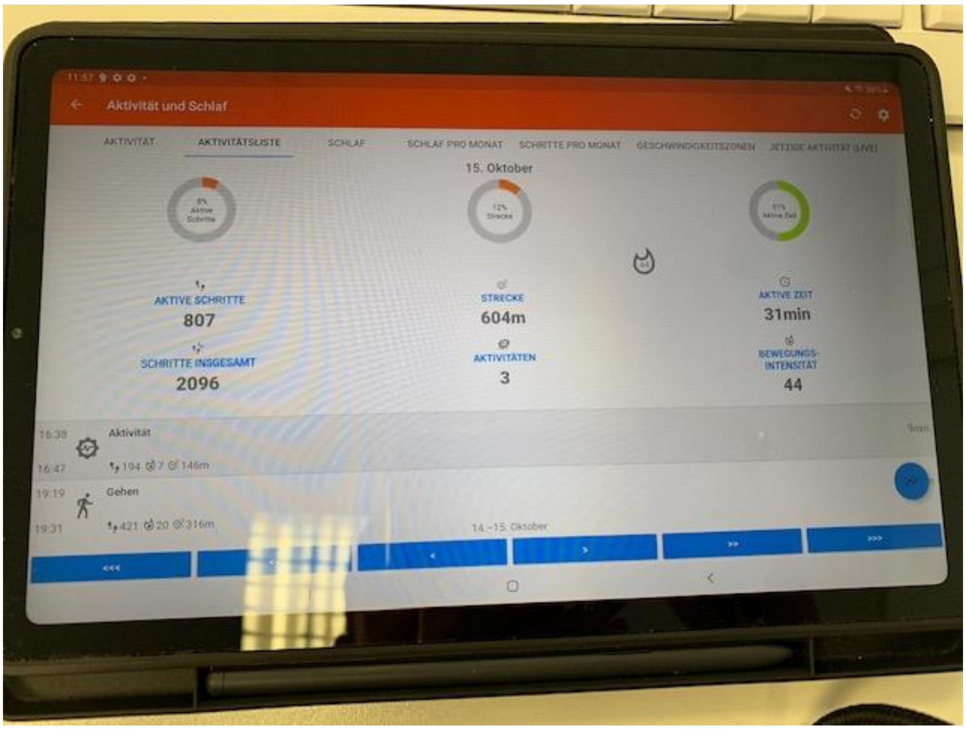
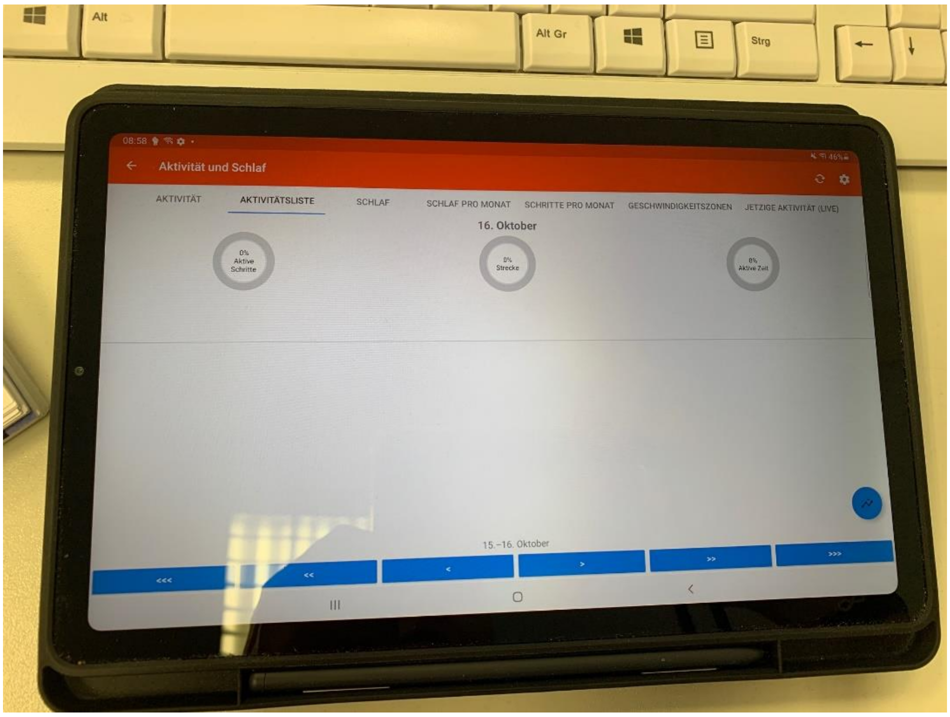
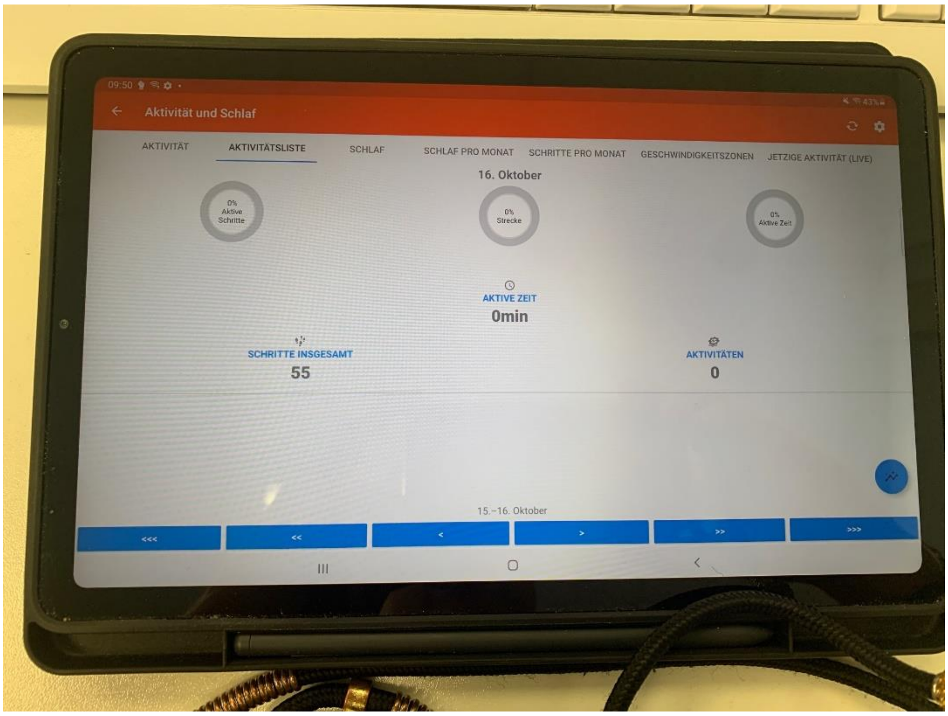




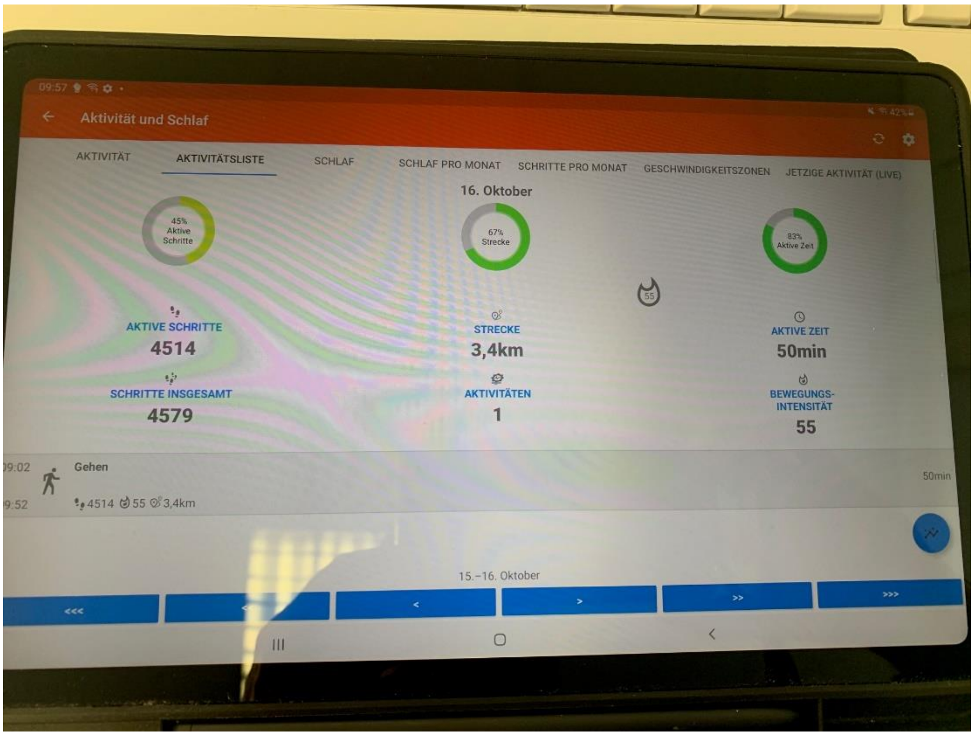
Now data is correct.

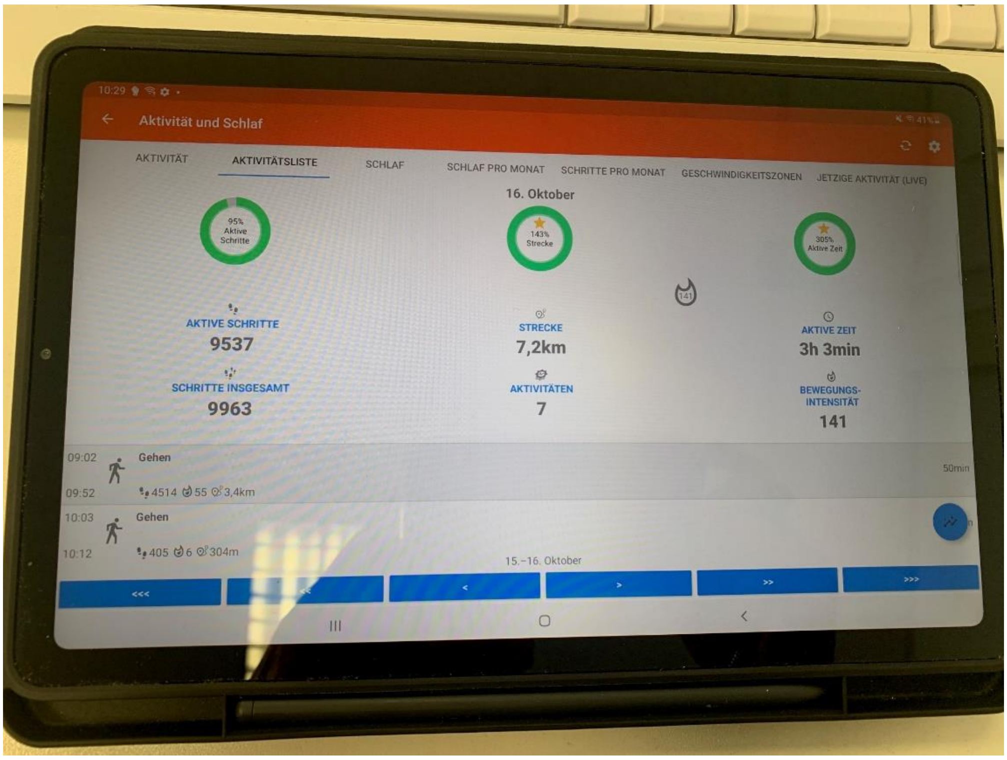
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159



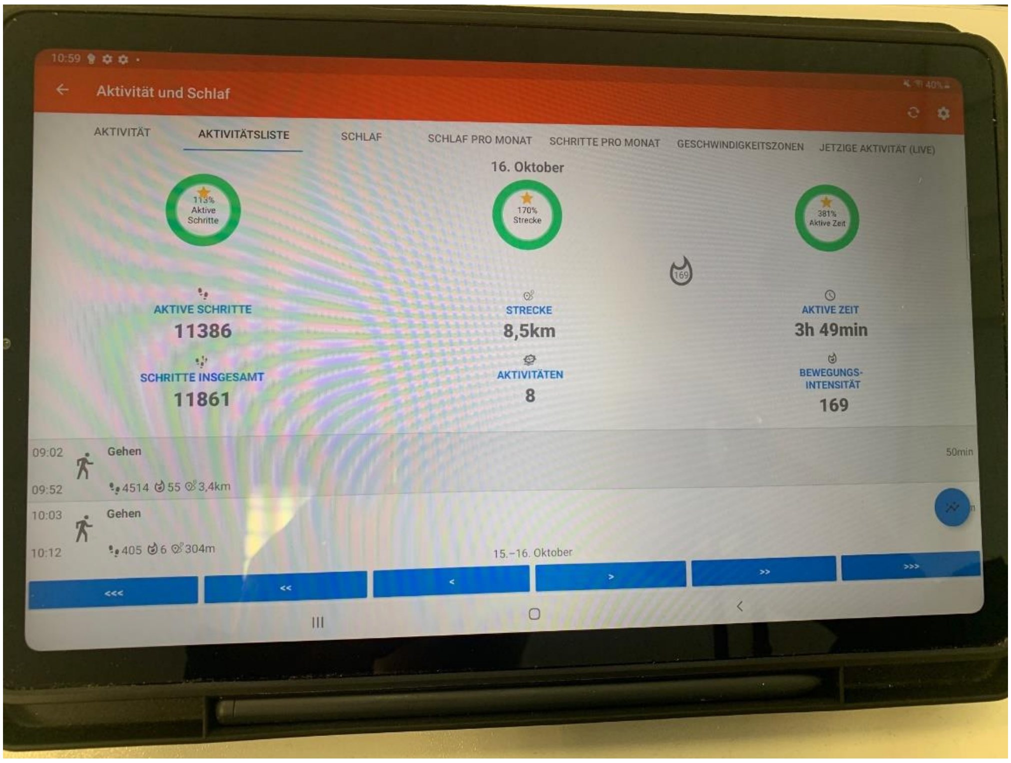


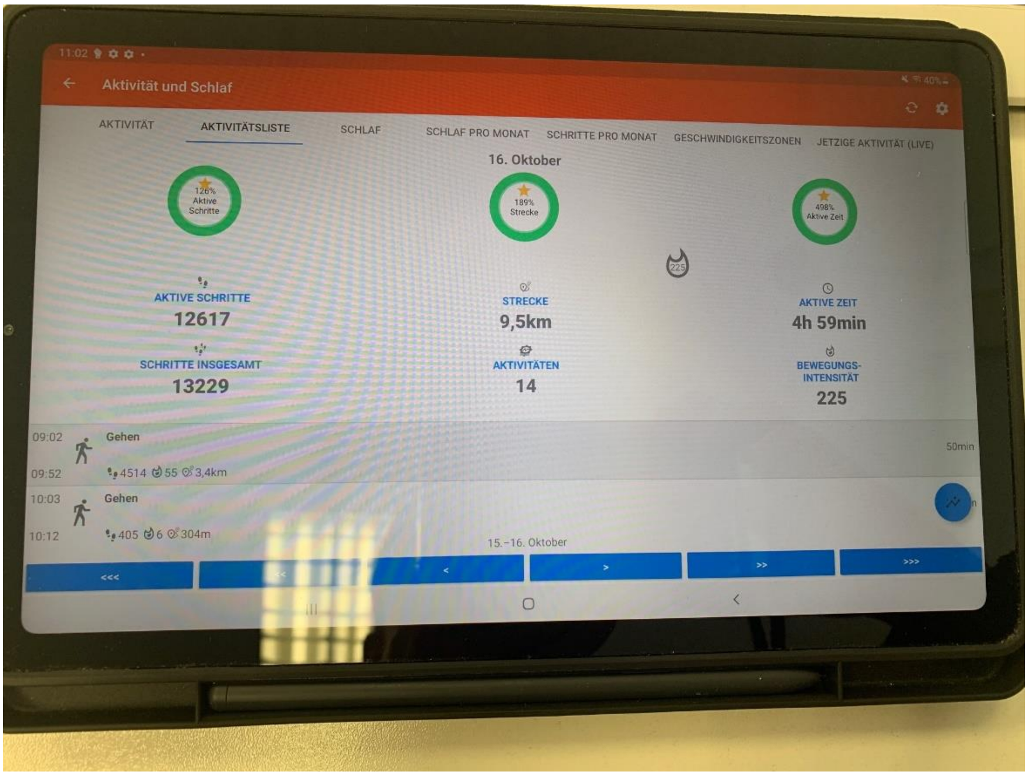
This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 857159





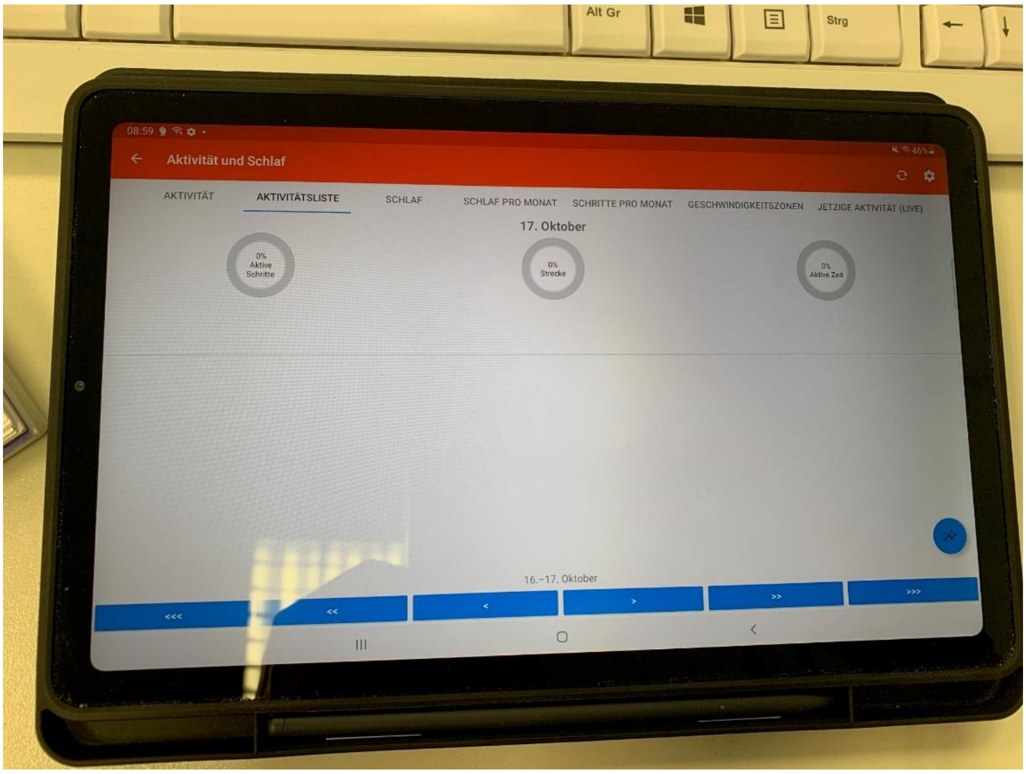
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

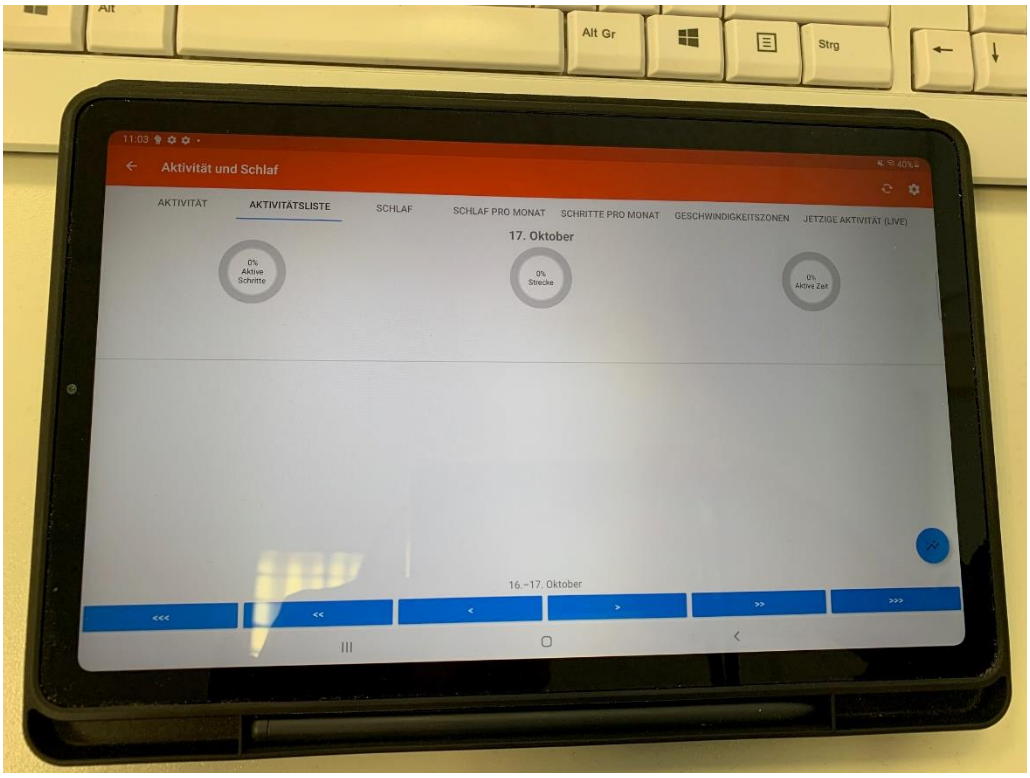




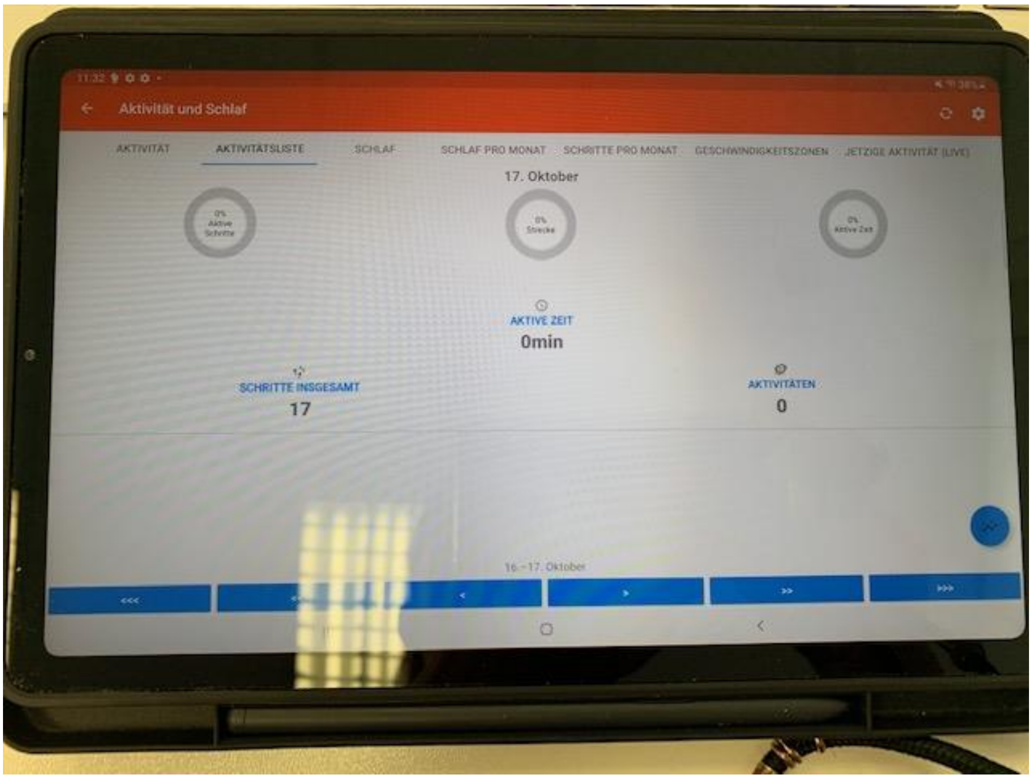
Now the data is correct.

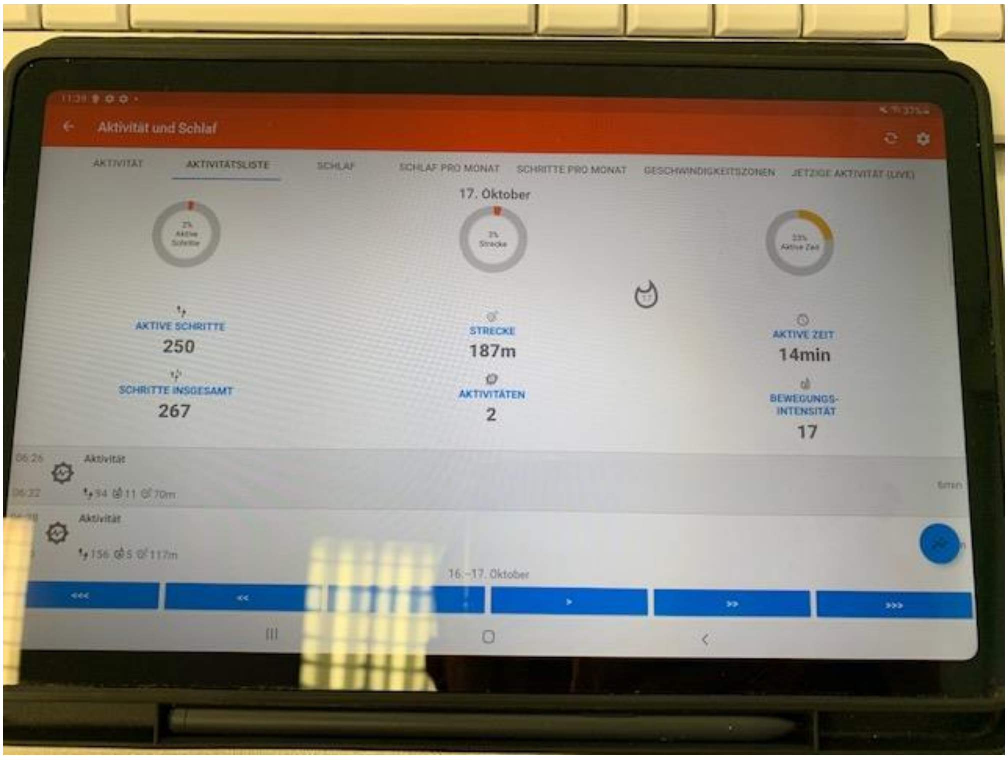
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159



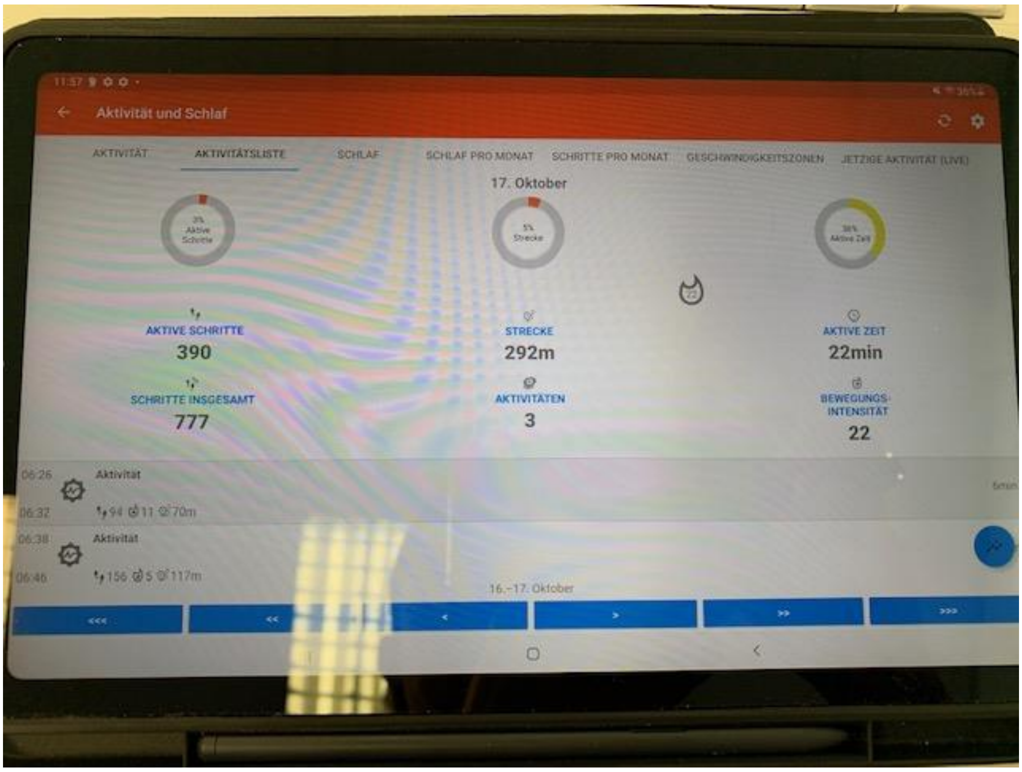


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159





This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

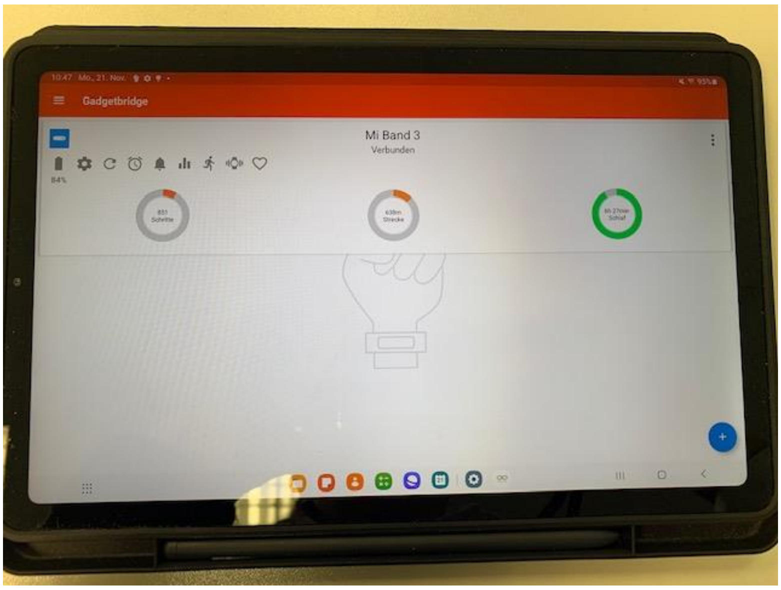


Data on the fitnesstracker at this time: 896 steps.

7) SHAPES PT 1 UC001

Feedback phase 4

21.11.2022



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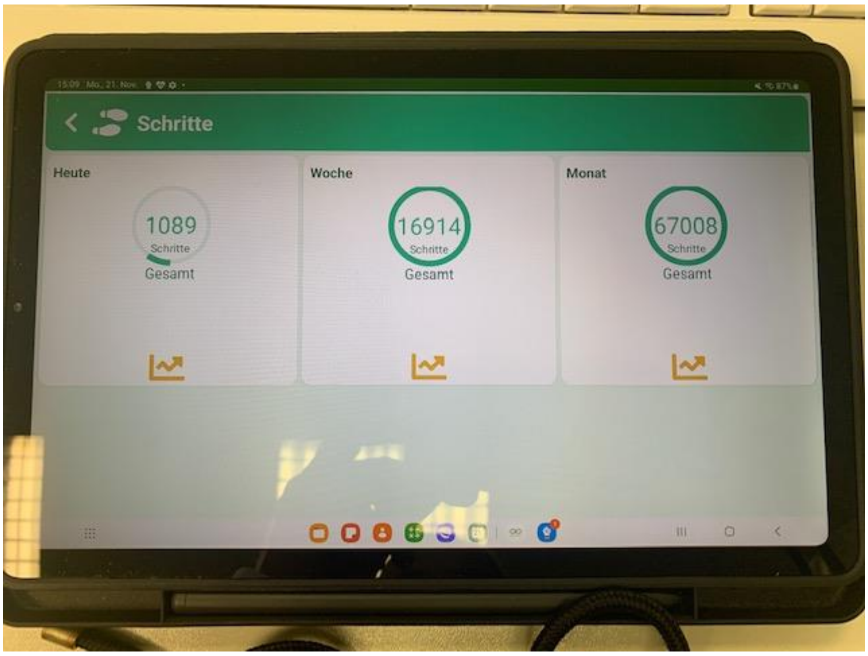
As I mentioned before I am wearing a new MiBand 3, because the other one is probably broken.

With the new one the synchronisation works very well, error-free.

Heart rate okay



Steps okay

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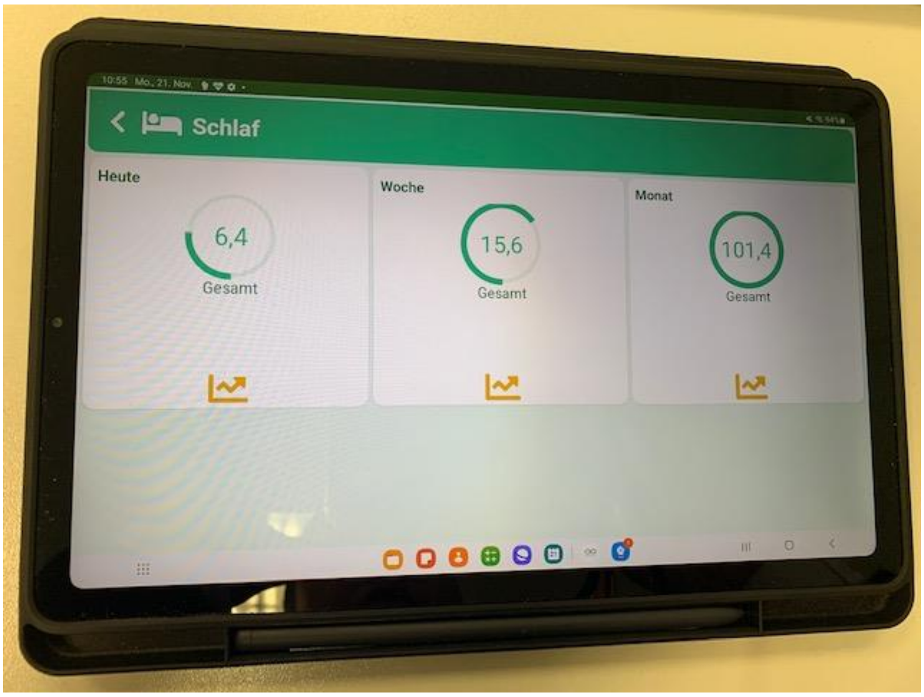
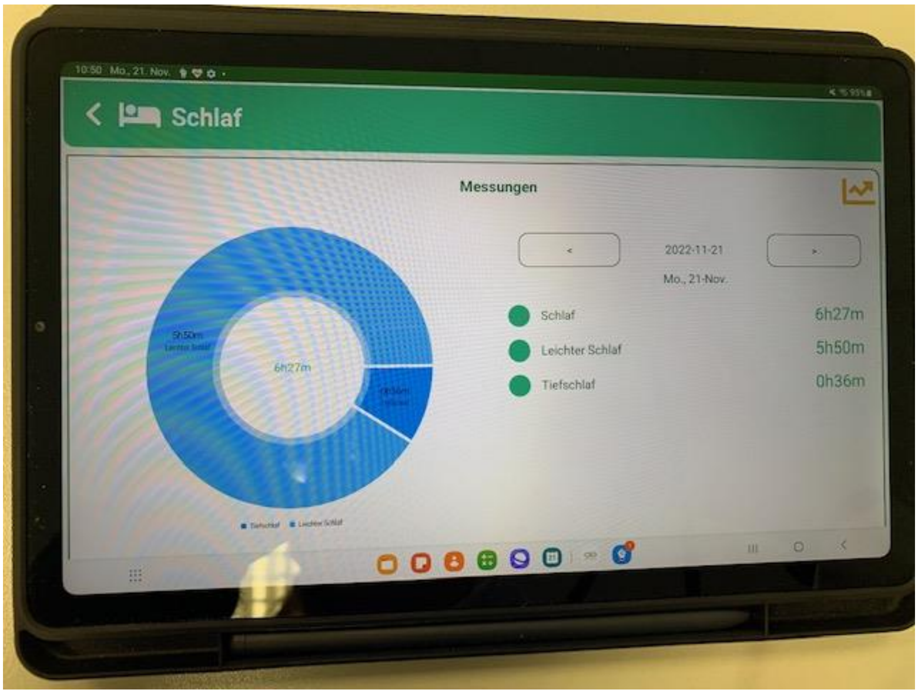
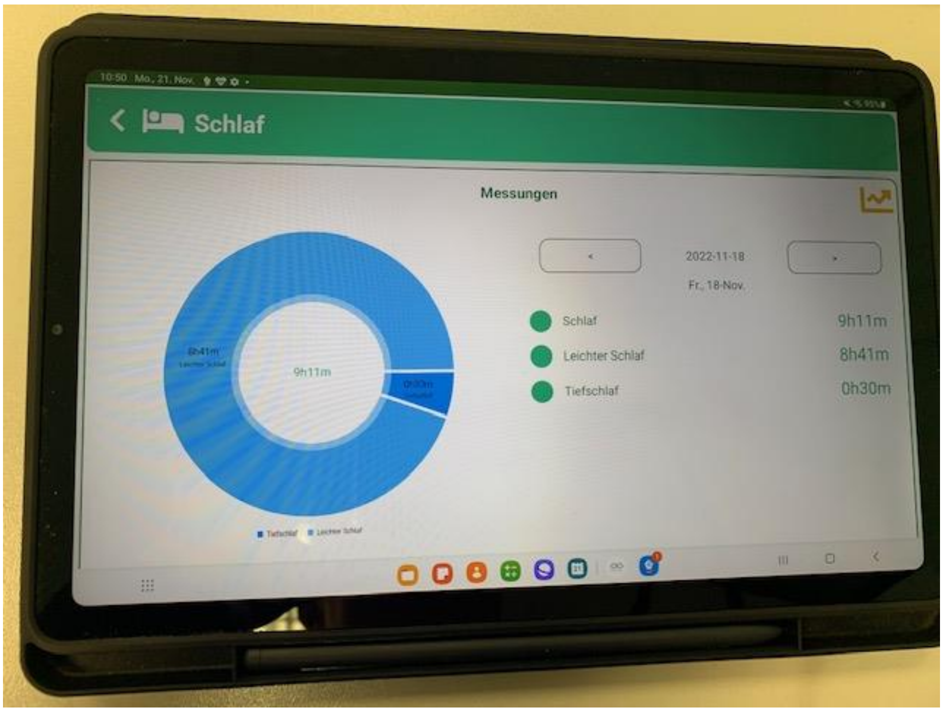
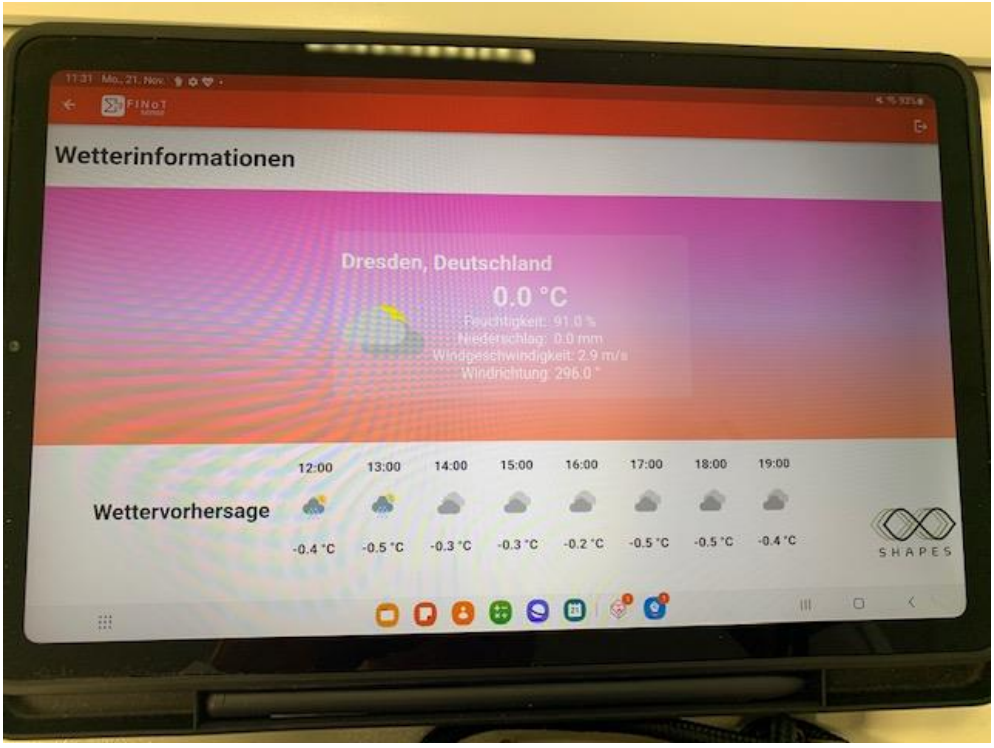




This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159



Sleep okay



Weather information okay

It is like a picture, you can do nothing, no preview beyond the displayed time interval, no weather forecast to other areas or cities.

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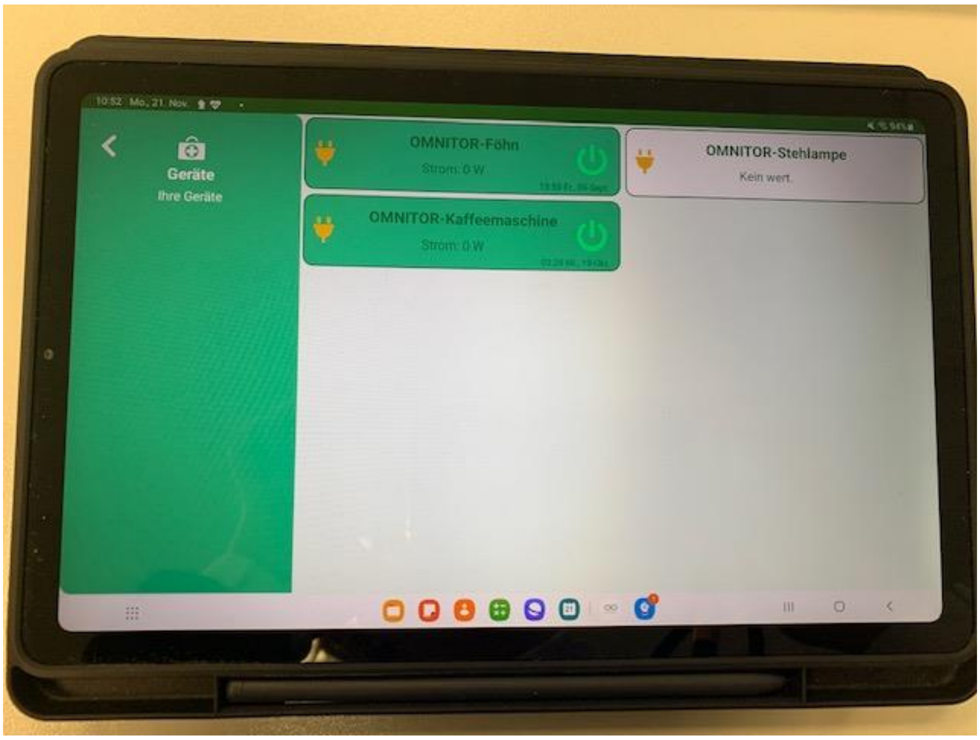
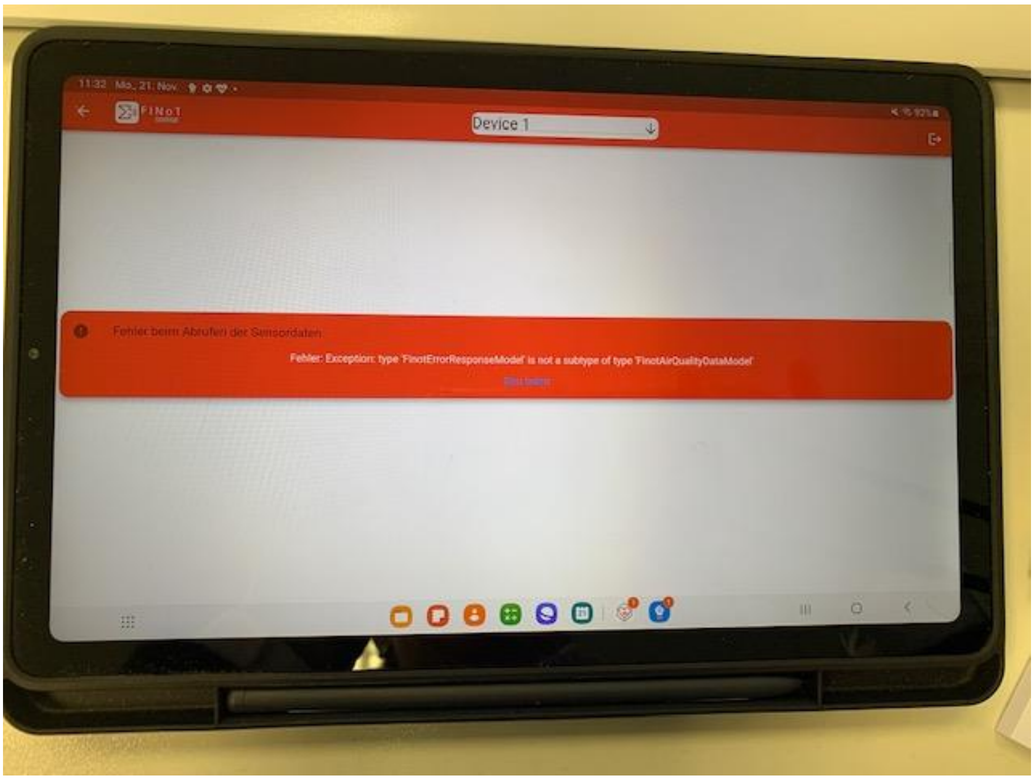


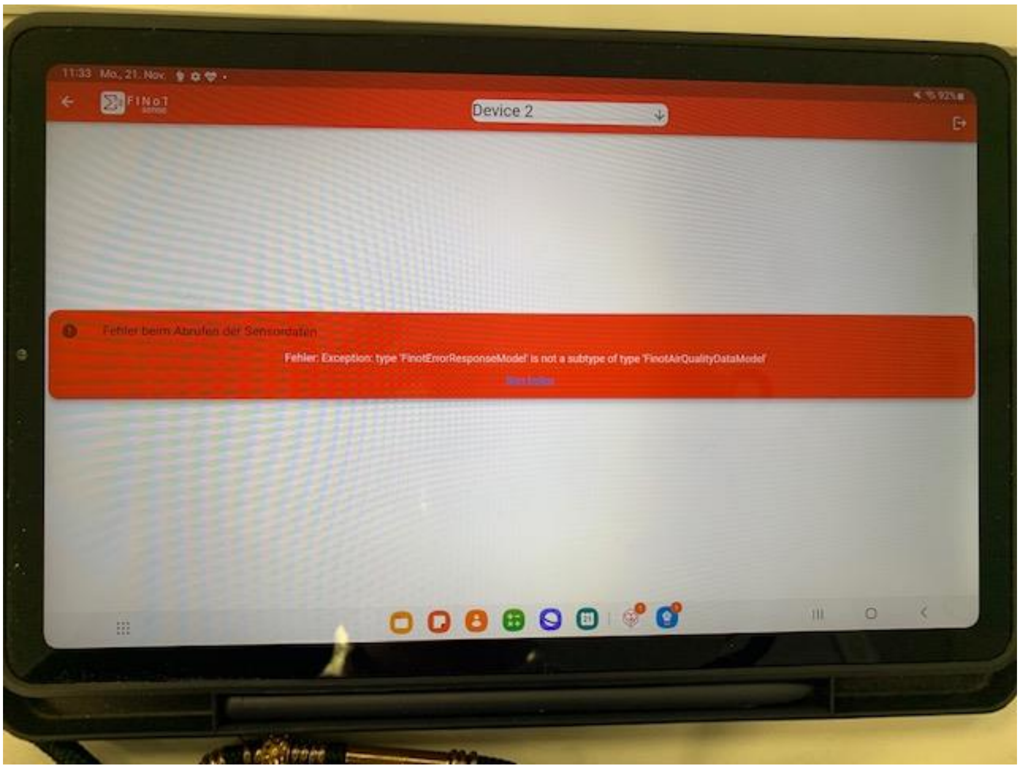
Device monitoring with the smart plugs does not work



Measurement with the air quality node does not work

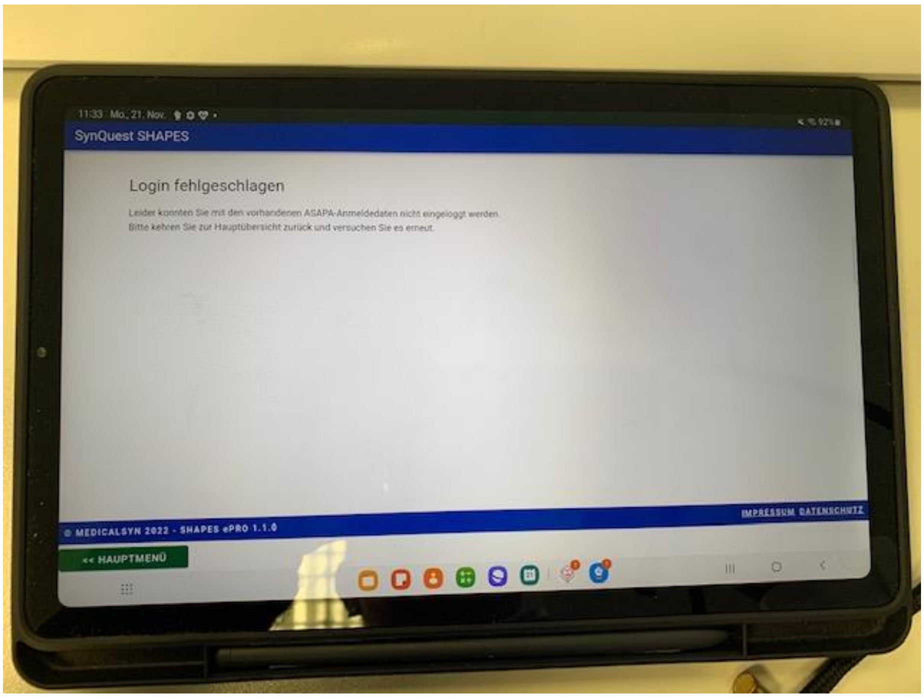
There is no data displayed.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159



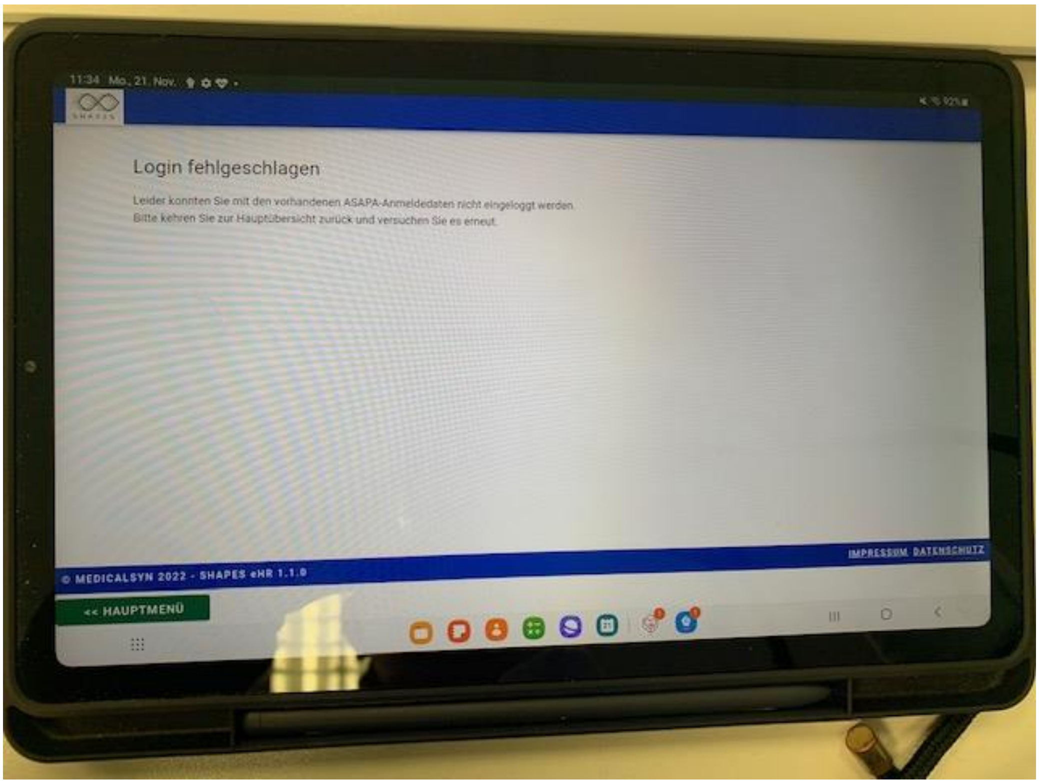
Measurement with the air quality node does not work

There is no data displayed.



The Login to MedSyn User profile does not work

I have already reported this to MedSyn.



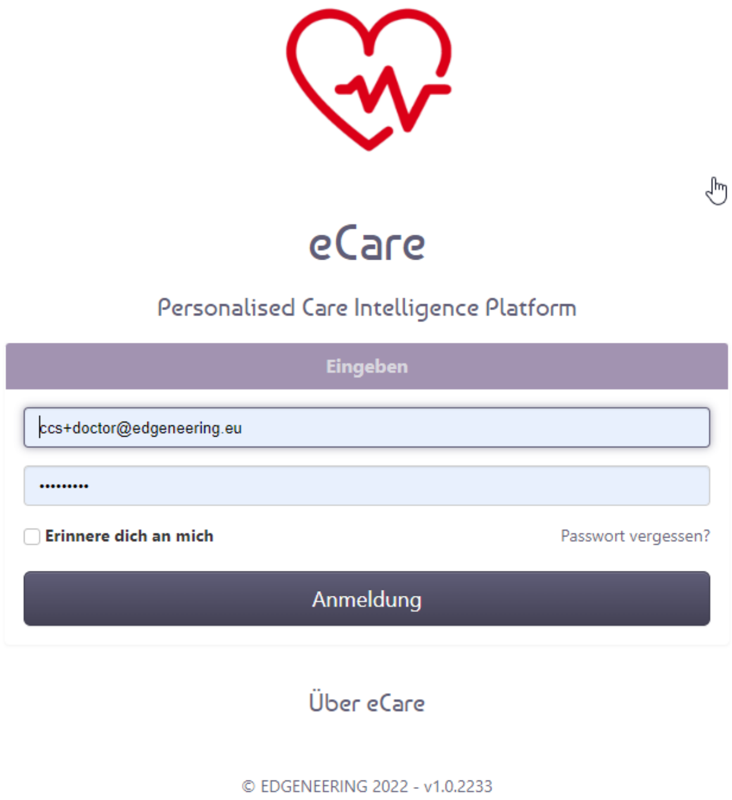
The Login to MedSyn questionnaire does not work.

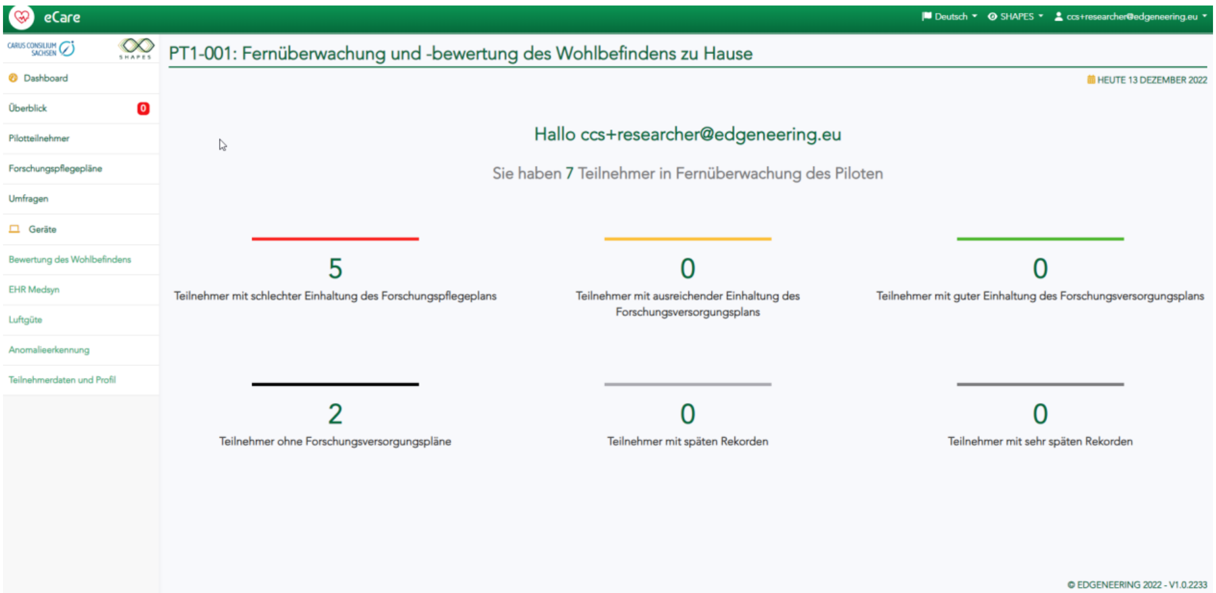
I have already reported this to MedSyn.

8) PT1 – UC1

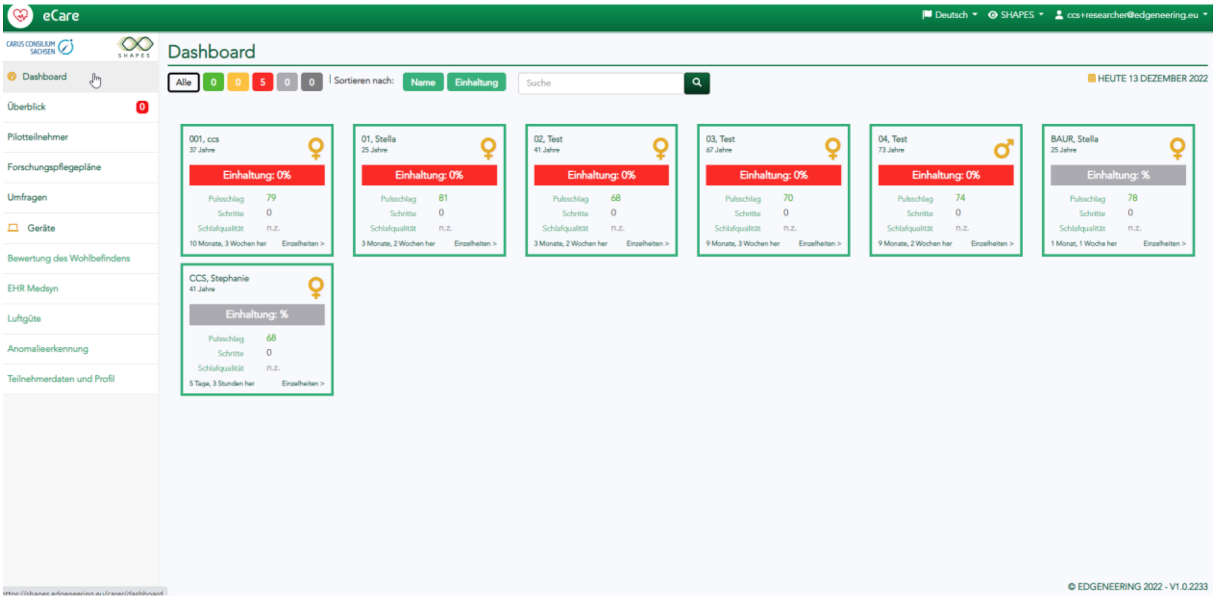
Feedback Tec Partner Dashboard
15.12.2022

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159



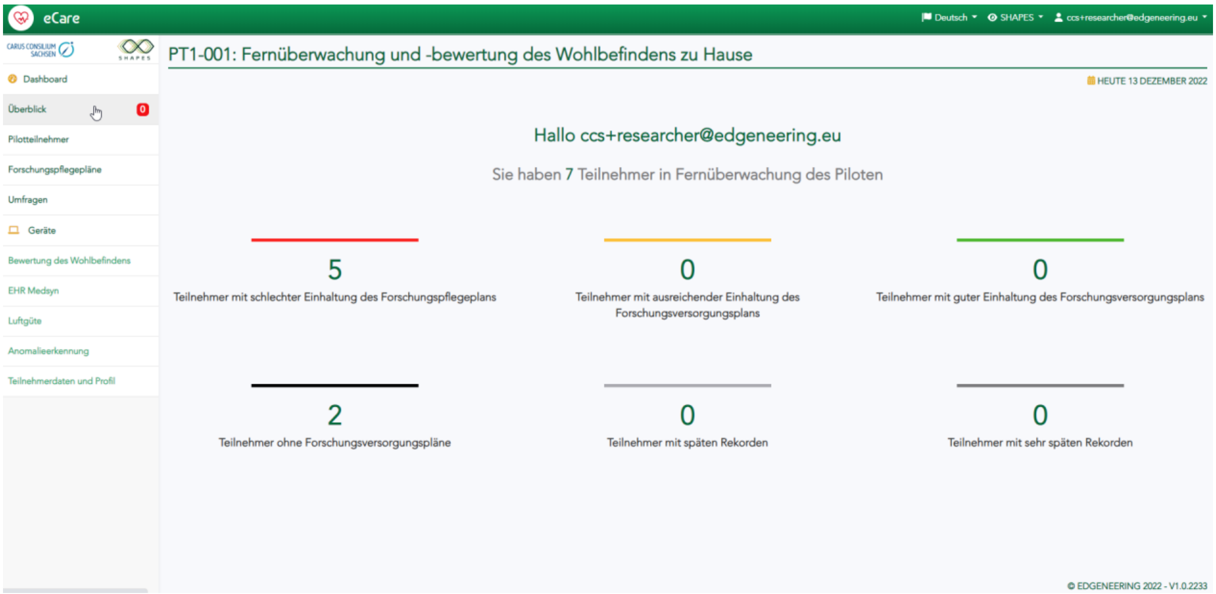


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

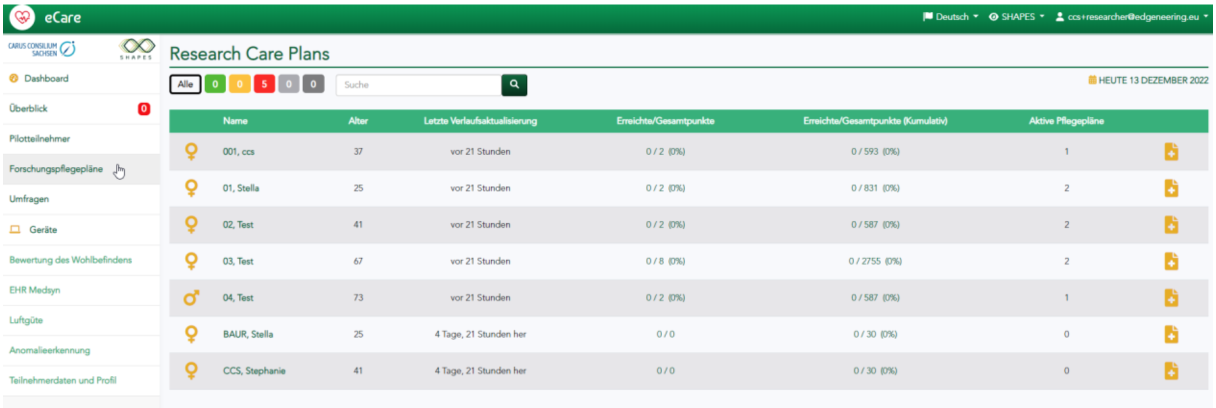


Dashboard

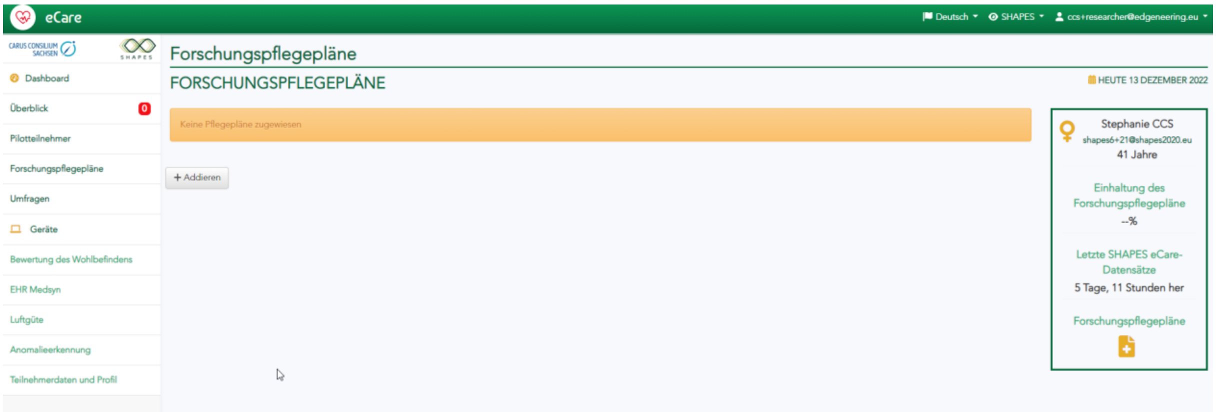
Testuser



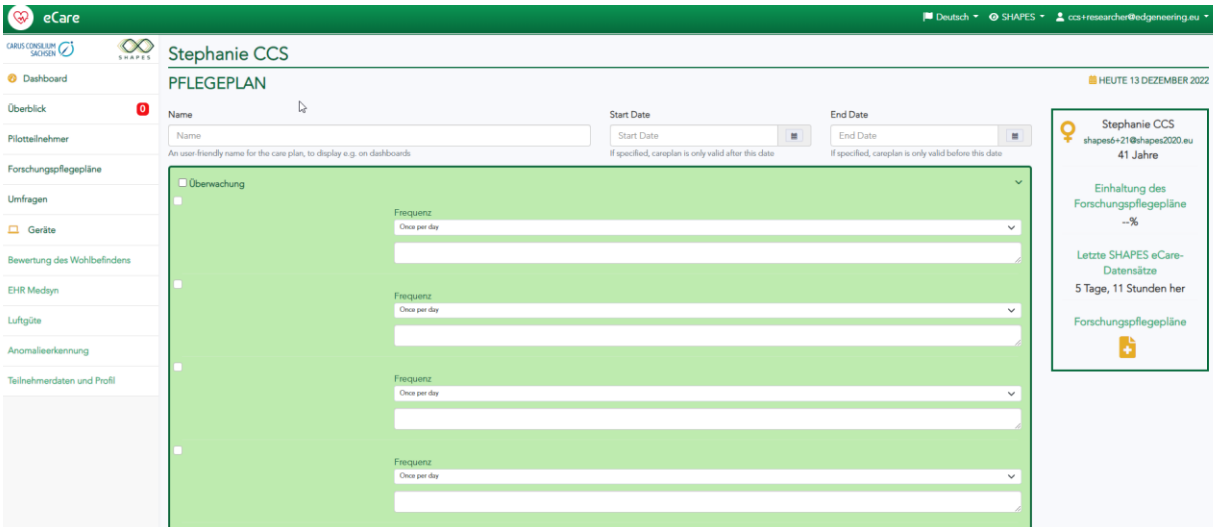
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

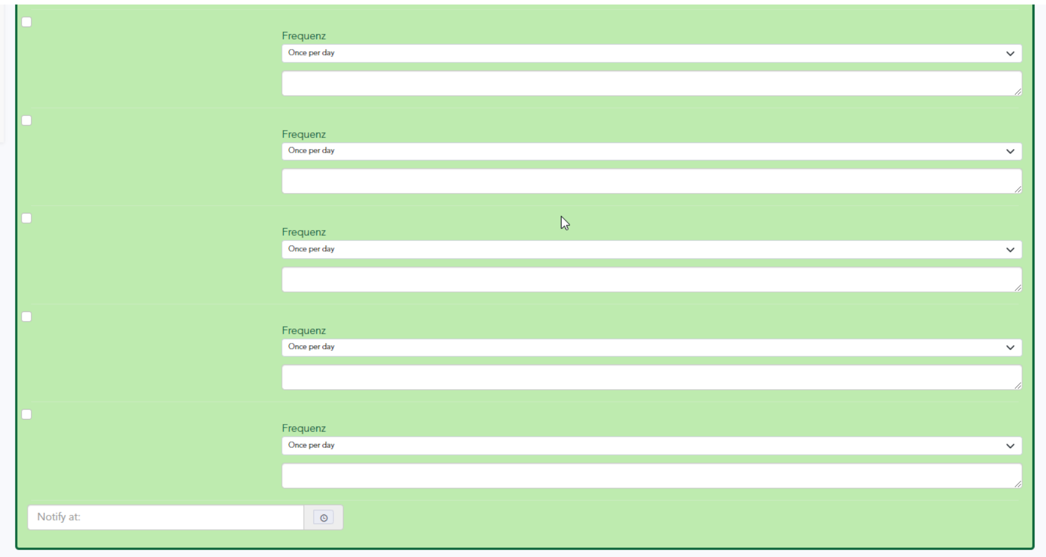


Forschungspflegepläne/research care plans

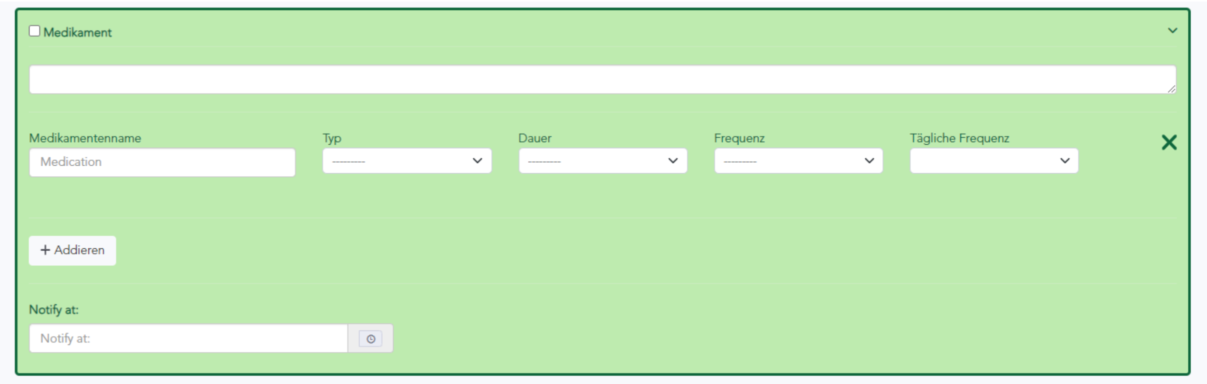


“Addieren” rename in “Hinzufügen”





What is to be monitored here? What does it mean? What is here to do?



Not relevant for CCS; Can this be hidden for CCS?

Not relevant for CCS; Can this be hidden for CCS?

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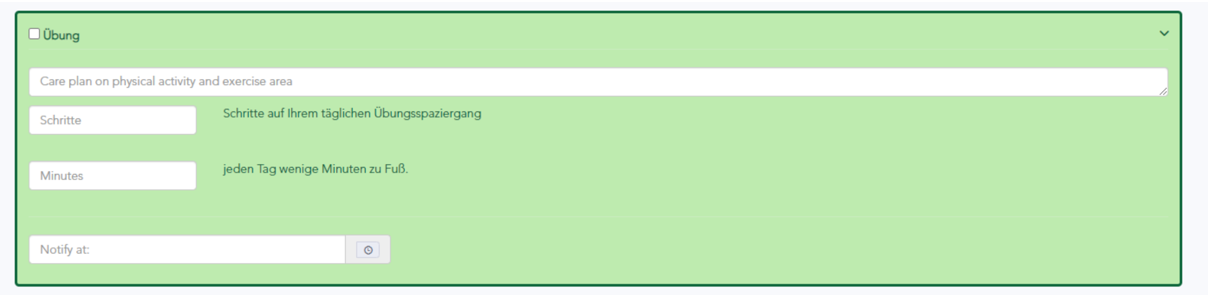
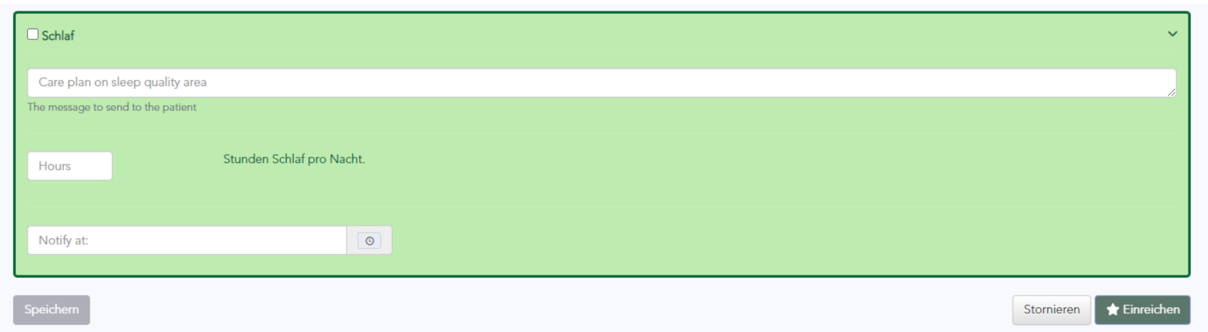
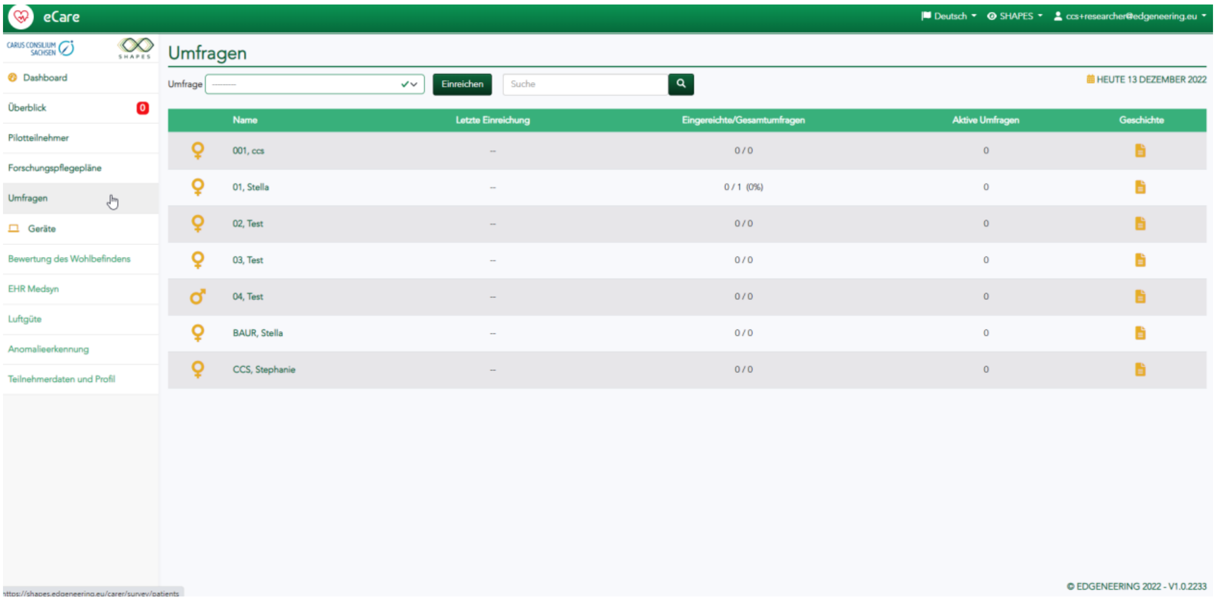
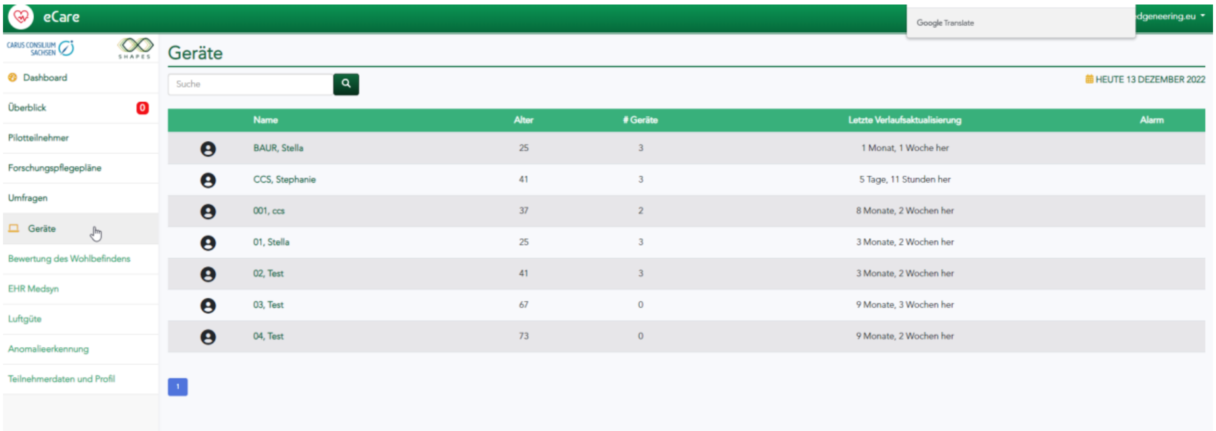
Not relevant for CCS; Can this be hidden for CCS?

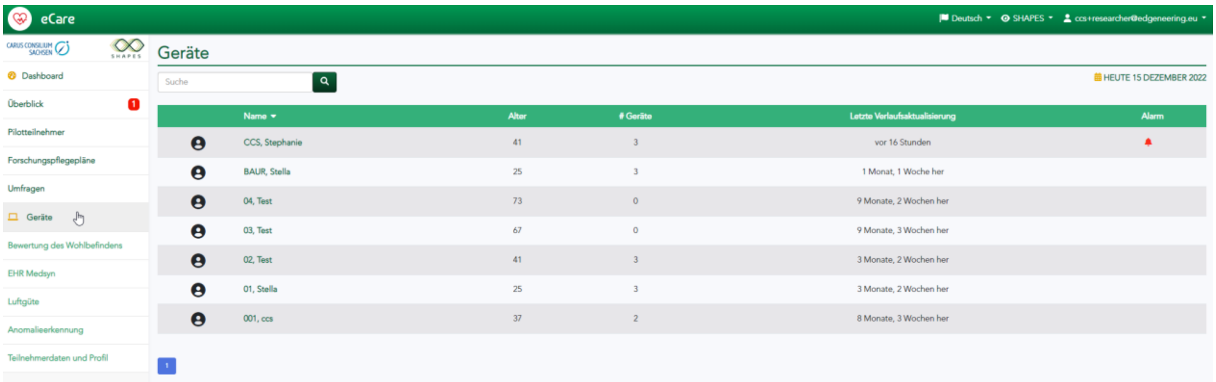




This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159







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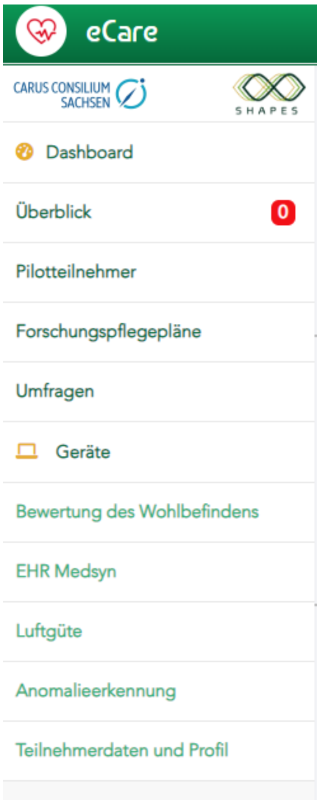
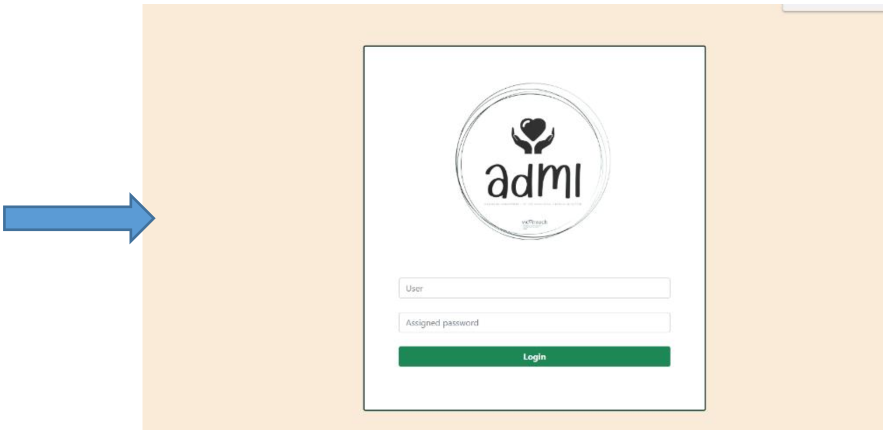
Update 15.12.22: There is an alert symbol (CCS,) – what does it mean?



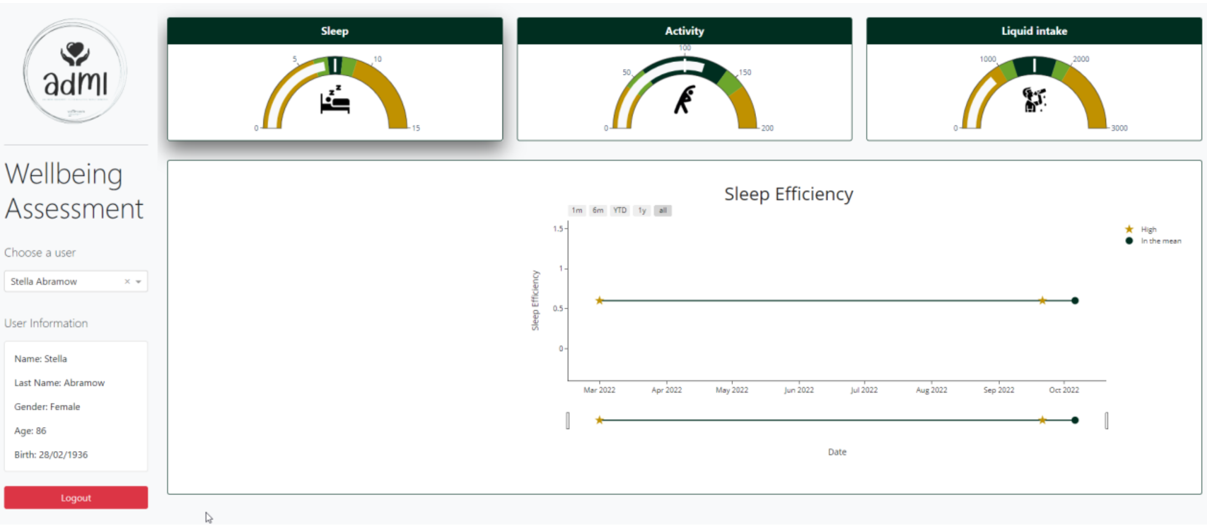


Click on „Bewertung des Wohlbefindens" – Link to VICOM;

https://shapes.vicomtech.org/va/

The doctor login does not work:

The researcher login does work:



That is no participant from CCS!

What kind of data is this?

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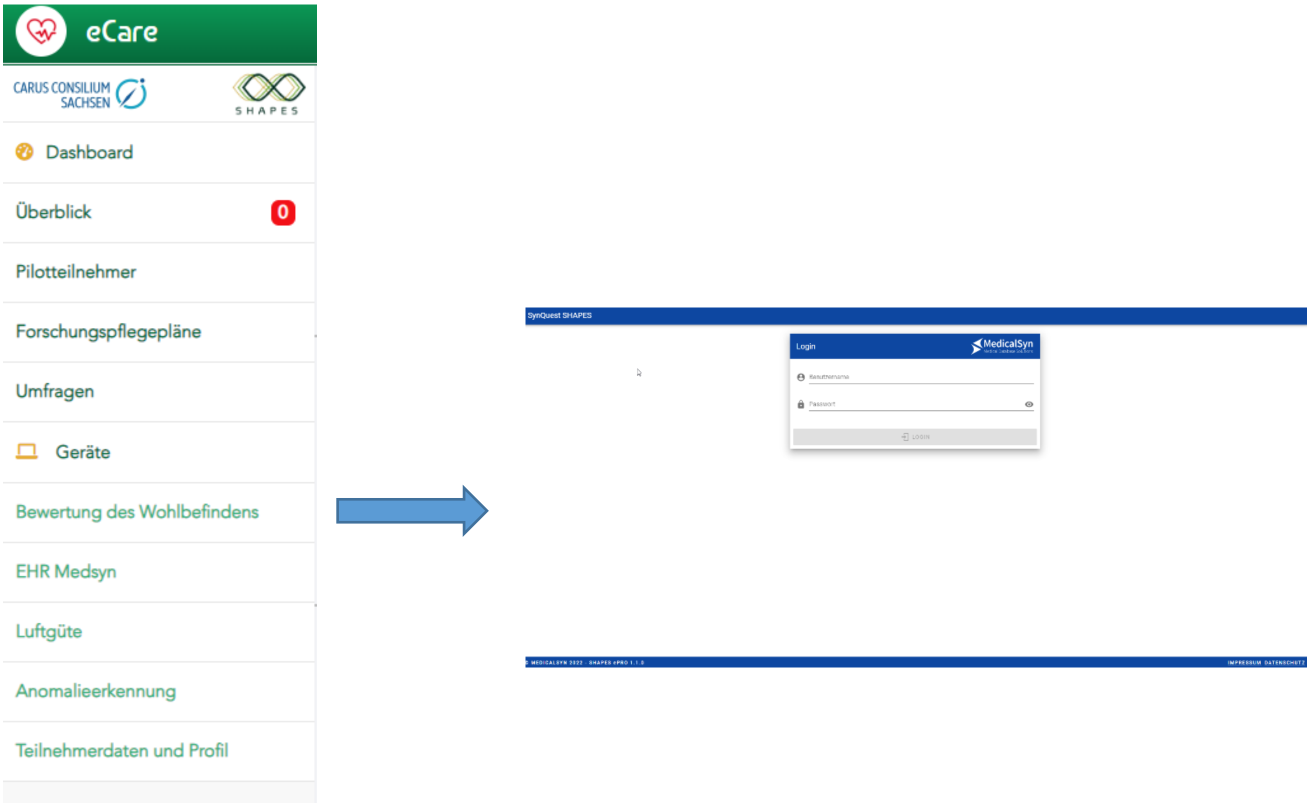
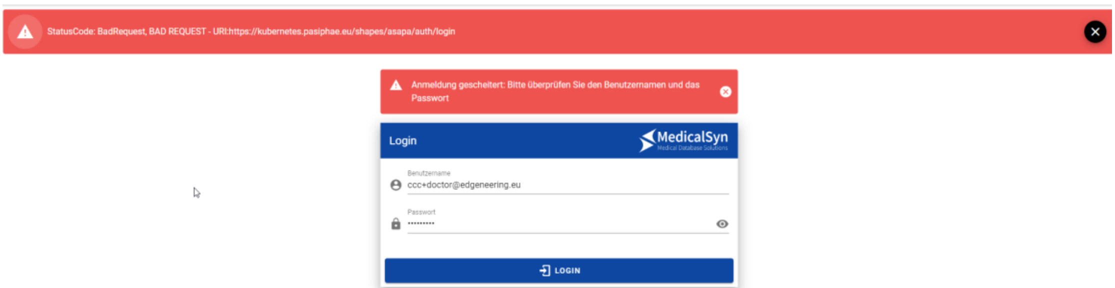


Click on „EHR MedSyn“ – Link to MedSyn SynQuest; - that is not the right link for EHR!

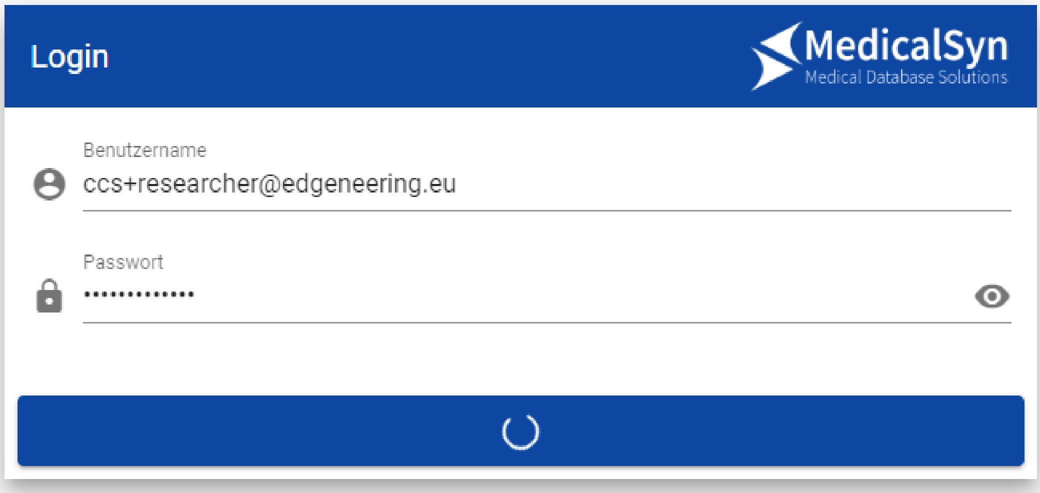
https://shapes-quest-demo.medicalsyn.com/#/

The doctor login does not work:

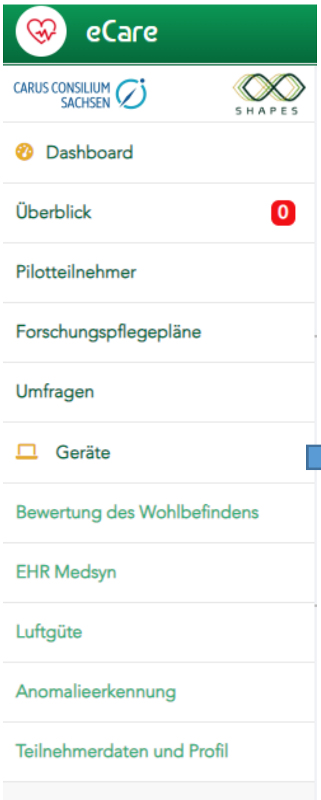


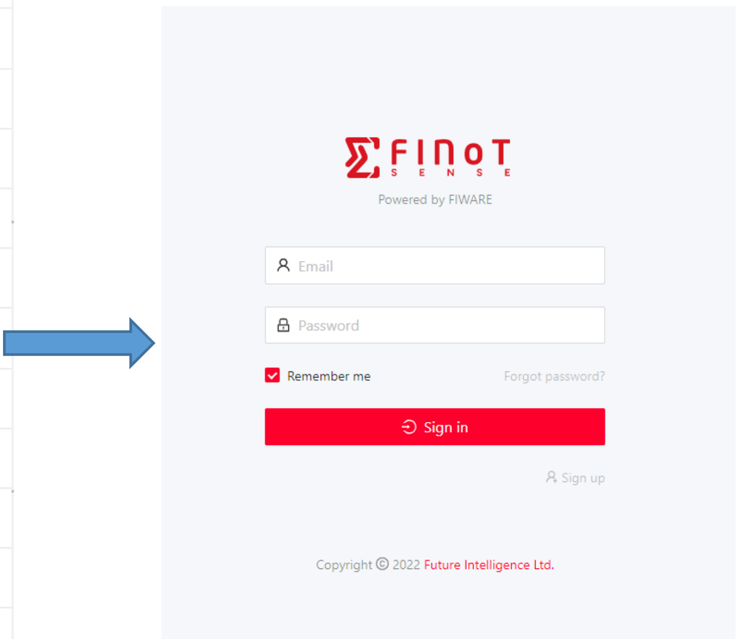
The researcher login does not work:

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 857159



No error-alert, but it does not open the site





Click on „Luftgüte" – Link to FINT

Please rename "Luftgüte" into "Luftqualität

https://app.shapes.finot.cloud/#/passport/login

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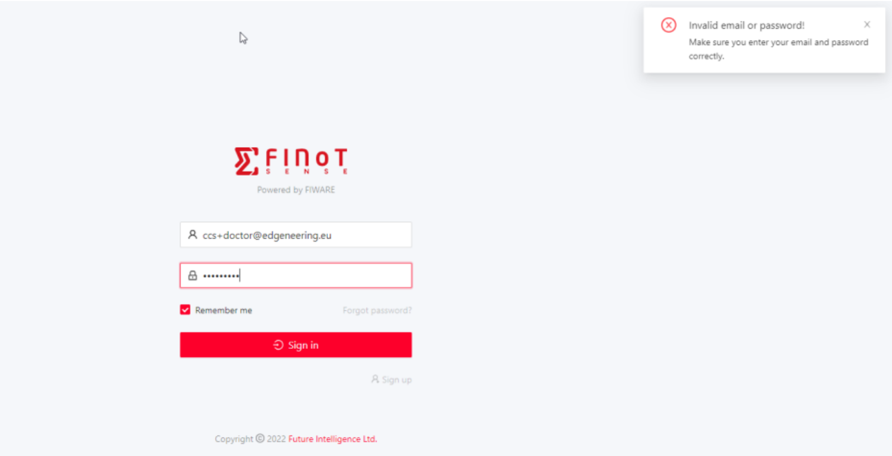
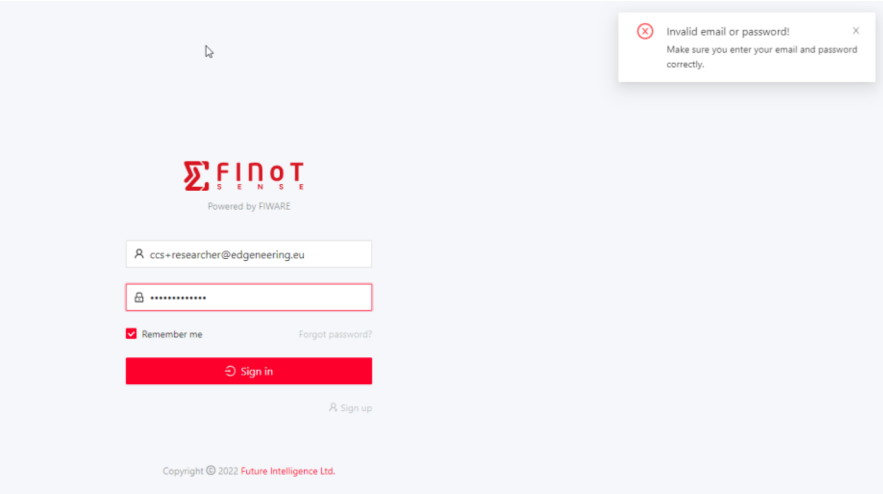
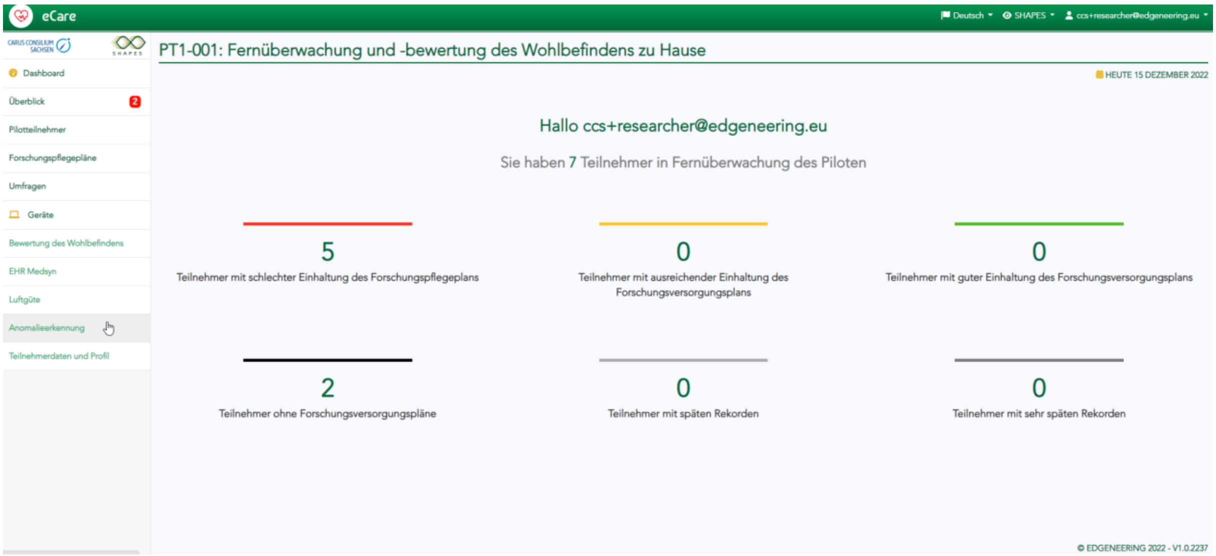
The doctor login does not work:



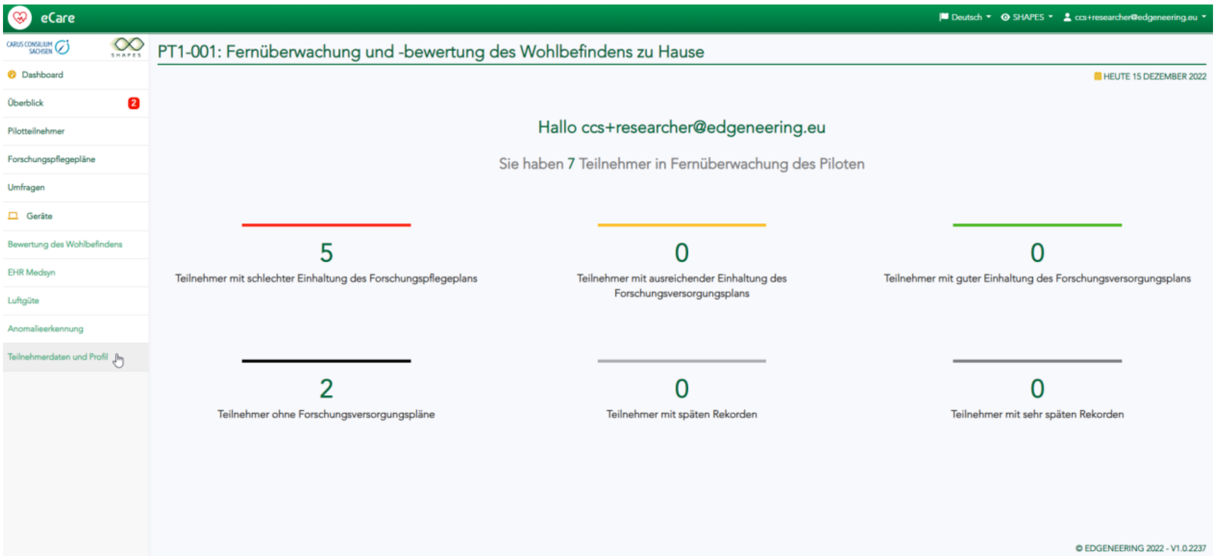
The researcher login does not work:



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159



Under “Anomalieerkennung” is no link



Under “Teilnehmerdaten und Profil” is no link

There is no link to MedSyn survey in the dashboard itself

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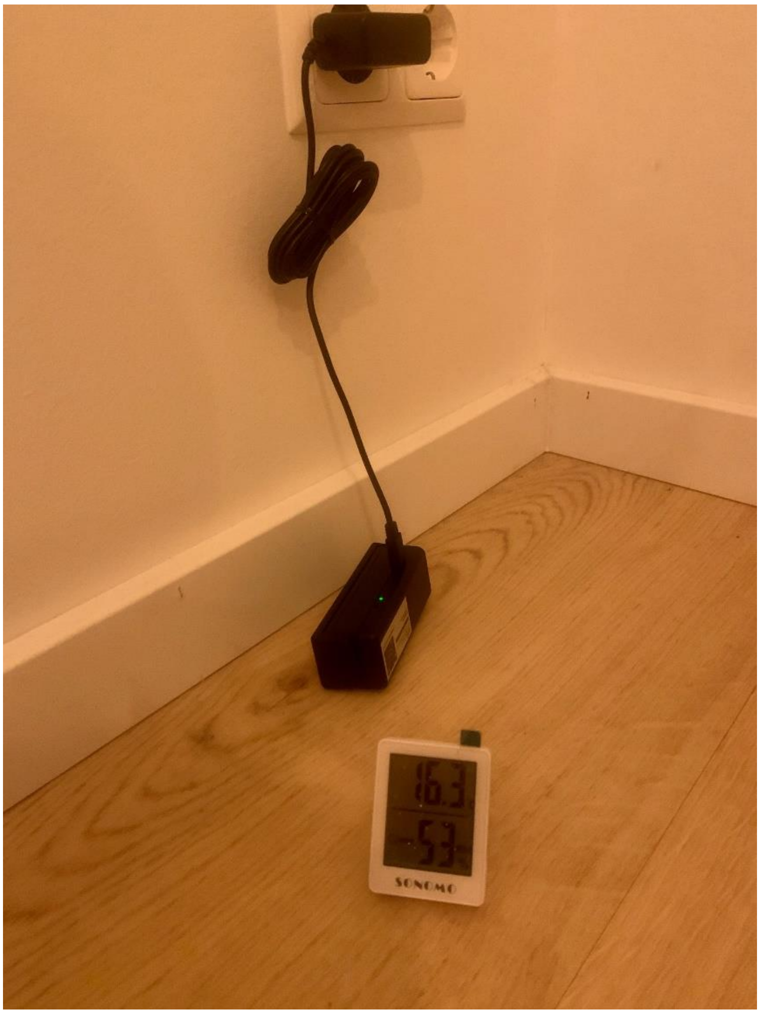
9**) Feedback Tec Partner PT1**

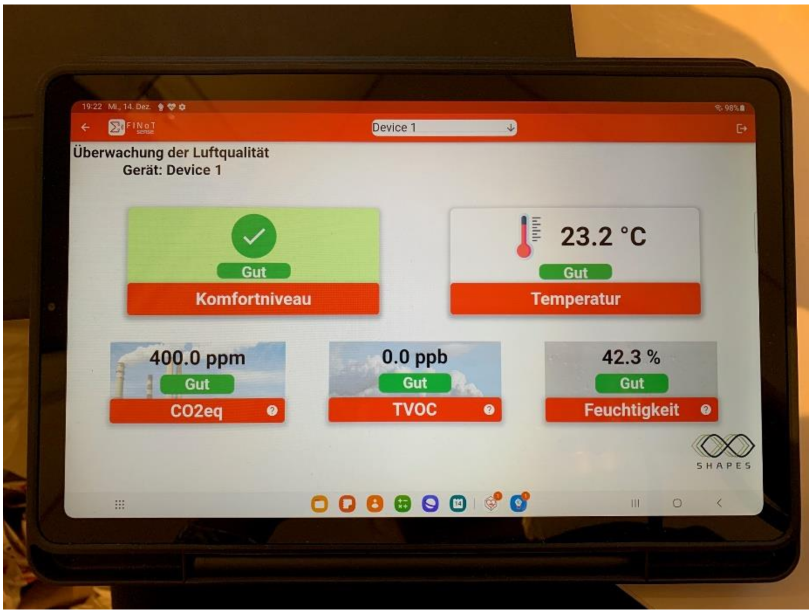
15.12.2022

Air Quality:

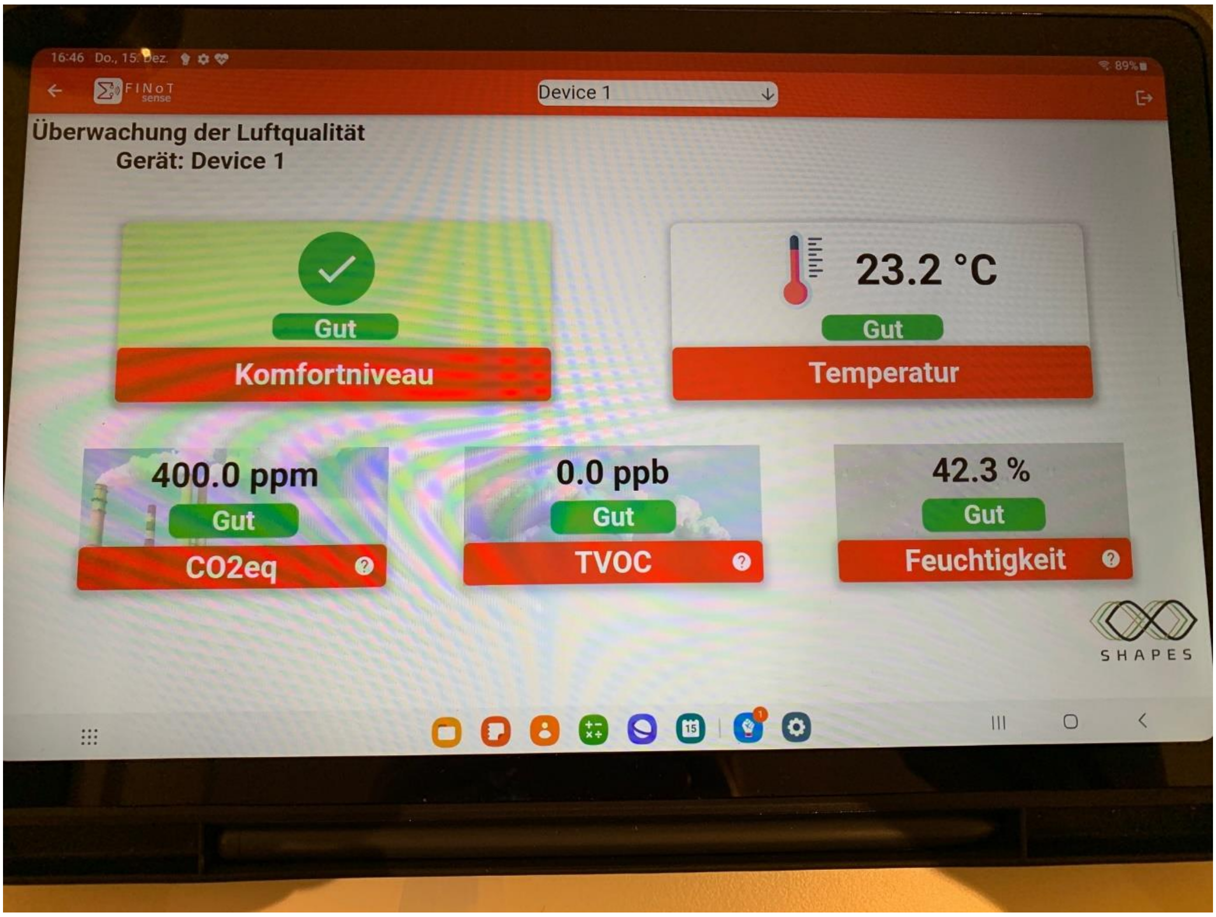
I checked the air quality data by an own thermometer and humidity meter:



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159



I think, we just get a picture with fake data.

By the way, the other participant get exactly the same “data”.

So, the air quality node does not work – it seems so.

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Annex 13

Information sheet for recruited participants

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_13_PT1_UC001_information-sheet-recruited-participants.pdf

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Annex 14

PT1 Risk assessment

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_14_PT1_Risk-assessment.xlsx

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Annex 15

UC-PT1-001 KPI 3, KPI 4

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_15_UC-PT1-001-KPI-3_4-MedSyn-questionnaire_survey.xlsx

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Annex 16

UC-PT1-001 Monitoring steps and sleep KPI 5, KPI 6

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_16_UC-PT1-001-KPI-5_6-Monitoring_steps_sleep.xlsx

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

Annex 17

UC-PT1-001 Support cases, KPI 7

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_17_PT1_UC001-Support-history-KPI7.xlsx

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Annex 18

UC-PT1-001 SUS Score

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_18_UC-PT1-001-KPI-8-SUS-Score.xlsx

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Annex 19

UC-PT1-001 Harmonised Data

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_19_PT1_UC001_Harmonised-Psychosocial-Data.xlsx

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Annex 20

UC-PT1-001 Final Interviews with participants

Pilot 1 UC001 final interview participants

Digital solutions:

- SHAPES App in general / Tablet
- Smart plugs and monitoring electronical devices
- Air quality node
- Weather information
- MiBand with activity, sleep, heart rate
- Survey wellbeing

Now that you have been able to test the individual applications of pilot 1 UC001 in your own home environment, we would like you to answer a few more questions in summary.

Socio-demographic information:

age: ______________________________

gender: ______________________________

role (care receiver, care giver, researcher):
____

Experience with digital applications:

- ☐ high (daily use of digital applications)
- ☐ medium (at least 1x per week)
- ☐ low (at least 1x every 2 weeks)
- ☐ none at all (no experience at all)

Marital status:

- ☐ married
- ☐ living together
- ☐ Single (never been married)

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- ☐ Living separately
- ☐ Divorced
- ☐ Widowed

Education:

- ☐ University degree
- ☐ Higher education entrance qualification (general or subject-related)
- ☐ Intermediate school leaving certificate
- ☐ Secondary school leaving certificate
- ☐ Qualified lower secondary school leaving certificate

Do you get help from a family member in daily activities?

- ☐ never
- ☐ hardly ever
- ☐ sometimes
- ☐ often

A household may have different sources of income and it may be that more than one household member contributes to the income. Think about the total monthly income of your household: Is your household making ends meet?

- ☐ Very easy
- ☐ Easy
- ☐ Fairly easy
- ☐ With some difficulty
- ☐ With difficulties
- ☐ With great difficulty

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Perception and understanding

What is SHAPES from your point of view?

____

____

Were the individual applications understandable for you?

____

____

Were you able to operate the individual applications?

____

____

Do you find the visualisation attractive?

____

____

What do you like? / What do you enjoy?

____

____

Why?

____

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____

____

What do you not like?

____

____

____

____

Why?

____

____

____

____

Are you missing anything (e.g. information, a display, a key, a function)?

____

____

____

____

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Interaction / Intuition / Function

Was the handling comprehensible and understandable for you??

____
____

____
____

Were you able to find specific information within the applications?

____
____

____
____

Which functions were understandable?

____
____

____
____

...and which not?

____
____

____
____

Would you like to have reminders and recommendations? How many per day?

____
____

____
____

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Appearance / Layout

In general, how did you like the appearance / layout of the applications?

____
____

____
____

Were you able to read / recognise all the information?

____
____

____
____

How do you like the colour scheme?

____
____

____
____

Were the contrasts good?

____
____

____
____

Was the presentation well-arranged?

____
____

____
____

Did you feel overwhelmed or was it clear and well structured?

____
____

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In your opinion, should something be changed in the appearance?

General feedback

What do you think overall about SHAPES, the use case and the applications presented?

____

____

How do you rate it, how much training and support will you need to use these digital solutions?

____

____

Which functions / applications / digital solutions are most interesting and useful for you?

____

____

Which functions / applications / digital solutions are useless from your point of view? Which applications do you not need and why?

____

____

Would you continue to use the tested applications?

____

____

Do you find it generally useful to develop a specific platform for healthy ageing?

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If the SHAPES APP and the individual applications were to exist in the future, would you be willing to pay money for them?

Under what conditions would you be willing to use the SHAPES app in the future?

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System Usability Scale (SUS)

		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
1	I think that I would like to use this technology frequently	1	2	3	4	5
2	I found this technology unnecessarily complex	1	2	3	4	5
3	I thought this technology was easy to use	1	2	3	4	5
4	I think that I would need the support of a technical person to be able to use this technology	1	2	3	4	5
5	I found the various functions in this technology were well integrated	1	2	3	4	5
6	I thought there was too much inconsistency in this technology	1	2	3	4	5
7	I would imagine that most people would learn to use this technology very quickly	1	2	3	4	5
8	I found this technology very cumbersome (awkward) to use	1	2	3	4	5
9	I felt very confident using this technology	1	2	3	4	5
10	I needed to learn a lot of things before I could get going with this technology	1	2	3	4	5

Thank you for your time & feedback!

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Annex 21

UC-PT1-001 Evaluation of the final interviews

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_21_PT1_UC001_Evaluation-final-interview-second-output.pdf

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Annex 22

UC-PT1-002 Data Plan

Outcome	Domain	Type of variable	Frequency of assessment
General data (i.e. data related with all pilot goals/covariates)			
Caregiver data			
Caregiver age	Socio-demographic	Discrete	Baseline (T0)
Caregiver highest educational degree	Socio-demographic	Nominal	Baseline (T0)
Caregiver spatial distance to care receiver	Socio-demographic	Continuous	Baseline (T0)
Internet-related variables with regard to care receiver			
Access to device with internet connection at least twice a week (inclusion criteria; Yes/No)	ICT use characterization	Dichotomous	Baseline (T0)
Skilled to use internet (inclusion criteria assessed by referral of participants; Yes/No)	ICT use characterization	Dichotomous	Baseline (T0)
Frequency of internet use	ICT use characterization	Discrete	Baseline (T0)
Caregiving-related data			
Type of care provided (Formal vs. informal)	caregiving characterization	Nominal	Baseline (T0)
Duration of care provision (in years)	caregiving characterization	Continuous	Baseline (T0)
Frequency of care provision (number of hours per week)	caregiving characterization	Discrete	Baseline (T0) / Continuous data collection (at half and end of phase)
Existence of other care providers (Yes/No)	caregiving characterization	Dichotomous	Baseline (T0) / Continuous

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			data collection (at half and end of phase)
Relationship with the care receiver	caregiving characterization	Nominal	Baseline (T0)
Cohabitation with the care receiver (Yes/No)	caregiving characterization	Dichotomous	Baseline (T0) / Continuous data collection (at half and end of phase)
Care receiver data			
Care receiver age	Socio-demographic	Discrete	Baseline (T0)
Care receiver gender	Socio-demographic	Nominal	Baseline (T0)
Degree of dependence (subjectively evaluated by the informal caregiver)	Disease characterization	Nominal	Baseline (T0) / Continuous data collection (every third of the phase)
Individual top three challenges	Socio-demographic	Nominal	Baseline (T0)
Use Case 2 (Digital Assistance / NLP)			
Number of interactions with digital assistant	Acceptance	Discrete	Continuous data collection (daily)

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Annex 23

UC-PT1-002 MOMENTUM

7 List of indicators

For ease of use, this section contains a complete list of the 51 indicators already presented sequentially in Sections 3-6 in the context of each individual critical success factor.

7.1 Context

7.1.1 CSF 1. Ensure that there is cultural readiness for the telemedicine service

- In my organisation/region doctors and other healthcare professionals are ready to share clinical information with each other and with the patient i.e., there is a level of trust among all the stakeholders.

YES. According to interviews in mock-ups, participants of the pilot conducted by CCS are willing to share activity data with them.

- In my organisation/region user and providers (healthcare professionals) are ready to use ICT (e.g., computers, tablets, mobile phones).

YES. Care providers at health region Saxony already use ICT in their daily work. Patients usually accepts new technologies as far as they have a clear benefit.

- In my organisation/region financial and other incentives are aligned with the service to be deployed.

TO DO. Financial strategy has to be developed.

- In my organisation/region an underpinning culture embraces technology.

YES. CCS is aware of the importance of incorporating cost-effective digital solutions. CCS regularly supports and leads projects to develop digital solutions for seniors and improve care.

- In my organisation/region an underpinning culture welcomes and even promotes change, innovation and shows openness to new ideas.

YES. CCS is a partner in several projects that promote the development of digital technologies in healthcare. CCS is in regular contact with relevant networks.

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7.1.2 CSF 2. Come to a consensus on the advantages of telemedicine in meeting compelling need(s)

- In my region/organisation there is general consensus on the current telemedicine solution being the best available solution for meeting a compelling need.

YES. The core business of CCS is the management and coordination of sustainable approaches to securing and improving healthcare, including video consultations or a digital therapy companion. The digital assistant is seen as a tool for constant interaction with the user.

- The current telemedicine solution is the best available solution for meeting a compelling need.

NOT SURE. The digital assistant as support in daily tasks and for alleviating isolation is still a research area, where more data is needed to optimise the type of interaction required for such goals.

7.2 People

7.2.1 CSF 3. Ensure leadership through a champion

- In my region/organisation there is one or several influential person(s) who take(s) on a leading role and leads the way towards deployment of the telemedicine solution tested in our project.

YES. CCS and MedicalSyn has developed a video consultation solution, which is used in several clinics of the University Hospital in Dresden.

7.2.2 CSF 4. Involve healthcare professionals and decision-makers

- Healthcare professionals have been involved in the development of the content of this project.

NO. The deployment of this use case did not foresee any participation of health care professionals and thus they have not been involved in the development.

- Healthcare professionals have been involved in the development of the process and time schedule for this project.

NO. The deployment of this use case did not foresee any participation of health care professionals and thus they have not been involved in the development.

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- Decision-makers have been involved in the development of the content of this project.

YES. Dr. Olaf Müller (former CEO of CCS) and Johannes Klaus (CEO of CCS) have been involved in the development of the content of this project, of the process and time schedule for this project.

- Decision-makers have been involved in the development of the process and time schedule for this project.

YES. Dr. Olaf Müller (former CEO of CCS) and Johannes Klaus (CEO of CCS) have been involved in the development of the process and time schedule for this project.

7.2.3 CSF 5. Put the patient at the centre of the service

- In this project[17] the patients have been sufficiently involved in the development of the telemedicine solution.

YES. Older people representative of final users have been involved in mock-up presentations in phase 2 and piloting activities in phase 5.

- In this project telemedicine service is based on the patient´s needs.

YES. Objectives is to promote social activity and active healthy ageing. Studies show that seniors who stay socially active and engaged experience a variety of benefits, both in physical and psychological health.

- In this project enough information and training is provided for the patients in order for them to obtain the best results possible from using the telemedicine solution.

YES. Training will be included in the design of phase 3, 4 and 5.

7.2.4 CSF 6. Ensure that the technology is user-friendly

- The telemedicine technology used in our project is user-friendly for patients.

TO DO. It is the objective and great effort is done within the SHAPES consortium to define requirements to fulfil this.

- The telemedicine technology used in our project is user-friendly for health professionals.

NO. User experienced is centred on the care receiver and care giver.

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- The telemedicine technology used in our project does not need an extended training process prior to using it.

YES. Half-day training is expected to be sufficient.

7.3 Plan

7.3.1 CSF 7. Pull together the resources needed for deployment

- In my region/organisation the financial resources needed for deployment of the telemedicine solution are available.

YES. SHAPES and already allocated internal resources are provided (for pilot).

- In my region/organisation the IT competences needed for deployment of the telemedicine solution are available.

YES. CCS staff is able to provide IT competences.

- In my region/organisation enough time for the training needed in order to implement the telemedicine solution is available.

YES. It is included in the SHAPES agreement.

7.3.2 CSF 8. Address the needs of the primary client(s)

- The telemedicine solution addresses the needs of the primary clients.

YES.

Older people living alone at home are the clients. The digital assistant provides support in daily activities, securing an autonomous life at home.

- The telemedicine solution is sufficiently adapted to the needs of the primary users.

YES. Needs were defined based on interviews with older people and caregivers.

- The telemedicine solution addresses the needs of the health sector.

NO: The primary objective of the digital assistant is to support older people at home. It does not take medical issues into account.

- The telemedicine service addresses the needs for efficiency improvement and improvement of quality in the health sector.

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NO. The digital assistant could increase the quality of life the seniors but is not affecting the efficiency or quality in the health care sector directly.

- The telemedicine service is adapted to the need for cooperation between municipalities.

NO.

- The telemedicine service is adapted to the need of the health sector for interaction in with the principle of Best Efficient Level of Care.

NO.

[17] The wording of these indicators tends to focus on use of the word project. However, in many telemedicine settings, words such as service or initiative or venture might prove to be more suitable. Alternatively, organisation or region might also be considered.

7.3.3 CSF 9. Prepare and implement a business plan

- A business plan for the project has been developed.

To do (D7.3 SHAPES Business Plan WP7)

- A business plan for the project has been implemented.

To do after the pilot.

- The business plan has been approved by the relevant management level.

To do after the pilot

7.3.4 CSF 10. Prepare and implement a change management plan

- A change management plan for the project has been developed.

To do after the pilot.

- A change management plan for the project has been implemented.

To do after the pilot.

- A change management plan has been approved by the relevant management level.

To do after the pilot.

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7.3.5 CSF 11. Assess the conditions under which the service is legal

- Prior to the start of the project, we assessed the conditions under which the service is legal.

YES. Completing a Data Protection Impact Assessment (DPIA) identified and minimized any risks associated with the pilot with input sought from other WP and the SHAPES Data Protection Officer at CCS. Data processing agreements will be established with relevant partners to permit access to pseudonymized data.

7.3.6 CSF 12. Guarantee that the technology has the potential for scale-up

- We are fully aware of what it takes for the technology to be deployed on a large scale.

To do after pilot. Scaling up of the digital assistant manufacturing is a complex process and needs to be evaluated along with the cost-efficiency analysis.

- In our region/organisation we are ready for large-scale deployment of the technology.

YES. CCS is working together with several facilities providing education for older seniors who are willing and interested to use digital solutions in their daily life.

- The project will supply the documentation needed to ensure that there is a basis for large-scale deployment of the project.

To do after the pilot.

7.4 Run

7.4.1 CSF 13. Identify and apply relevant legal and security guidelines

- The project is carried out in accordance with the relevant guidelines on legal matters.

YES. CCS was in contact with several DPOs.

- The project is carried out in accordance with the relevant guidelines on security matters.

YES. GDPR will be applied. The system provided implements all security and privacy related regulations.

7.4.2 CSF 14. Involve legal and security experts

- We have received advice on the project from legal experts.

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YES. We worked with LAUREA, with extensive expertise in this field and with VICOMTECH, who was awarded with the ISO 27001 certification for information security management.

- We have received advice on the project from experts on data security matters.

YES. CCS worked with SHAPES partners to implement a data management plan.

- In this project we are not experiencing any data security problems.

NO. However a risk assessment regarding data management will be developed and updated to foresee any potential data security problems.

- I have confidence in the legality of this project.

YES. It's a H2020 project with partners with extensive expertise in this field (LAUREA for example).

- I have confidence in the security of this project.

YES. It's a H2020 project with partners with extensive expertise in this field (HMU and PAL for example).

7.4.3 CSF 15. Ensure that telemedicine doers and users are privacy aware

- In this project the telemedicine doers are aware of protecting the patients´ privacy in terms of health information and other information collected during the course of the pilot.

YES. CCS works with data protection protocols. They will be also instructed the application of data protection with the new technologies introduced in the pilot. Older people and informal caregivers will be informed about data collection and process and consents will be collected.

7.4.4 CSF 16. Ensure that the information technology infrastructure and eHealth infrastructure are available

- We have ensured that the IT infrastructures needed are in place for deployment and large-scale implementation.

YES. Large-scale implementation will be evaluated after the pilot.

- We have ensured that the eHealth infrastructures needed are in place for deployment and large-scale implementation.

NOT SURE. All parts of the infrastructure are provided by SHAPES partners.

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7.4.5 CSF 17. Put in place the technology and processes needed to monitor the service

- We have set up a system to monitor our telemedicine service ensure that it is running smoothly at all times.

YES. In case of any bugs or issues the development team from the involved tec partner will fix it.

- We have set up a system to solve any incident that may occur during the service.

NOT SURE. The users get a support hotline during the different phases with a responsible contact person.

- We have a system which supports the end-users in resolving any doubts that they might experience with the telemedicine solution.

YES. Apart from the user manual, CCS ensures a direct communication to the participants.

7.4.6 CSF 18. Establish and maintain good procurement processes

- We have clear agreements regarding the quality of the deliveries provided by our vendors.

All technologies in current version of the technology come from SHAPES partners.

- We have clear agreements regarding the service level provided by our vendors.

All technologies in current version of the technology come from SHAPES partners.

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Annex 24

UC-PT1-002 Evaluation of the questionnaires of phase 2 (Mock-ups)

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_24_UC-PT1-002_Evaluation-questionnaires-Mock-up.xlsx

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Annex 25

UC-PT1-002 Test Protocol Phase 4

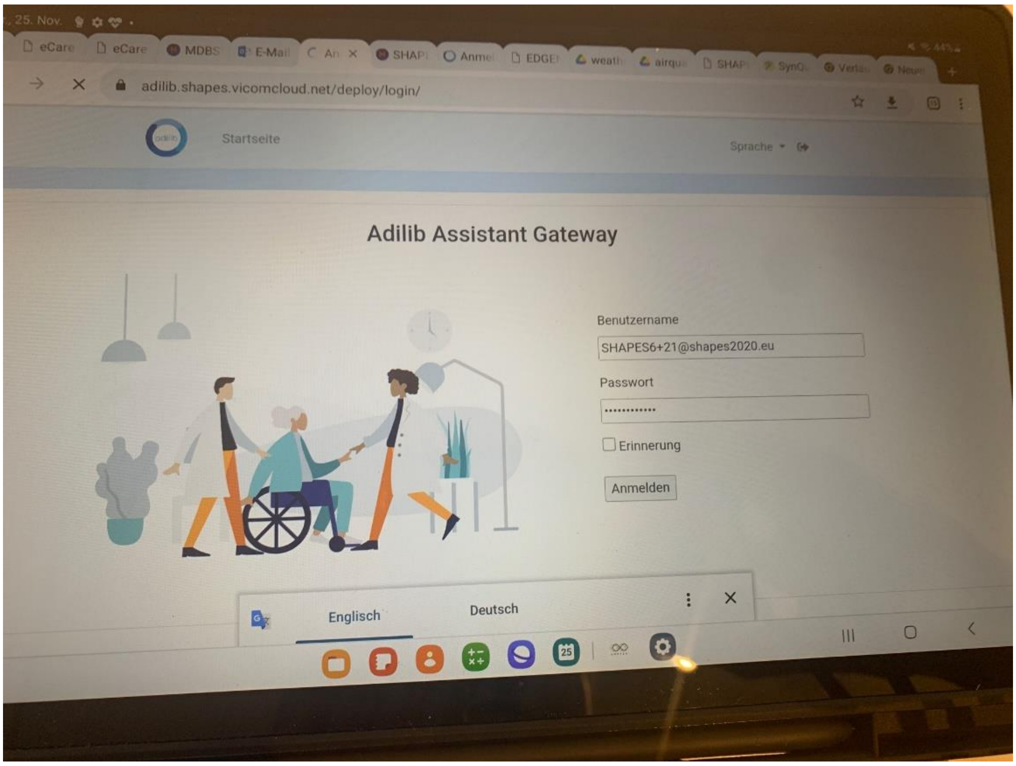
25.11.2022

-

- login to digital assistant: https://adilib.shapes.vicomcloud.net/deploy/

Login worked

We already tried to enter agenda and how-to skill with user SHAPES21, but unfortunately Nari does not understand. Attached you find a screenshot. We tried with text and voice navigation.



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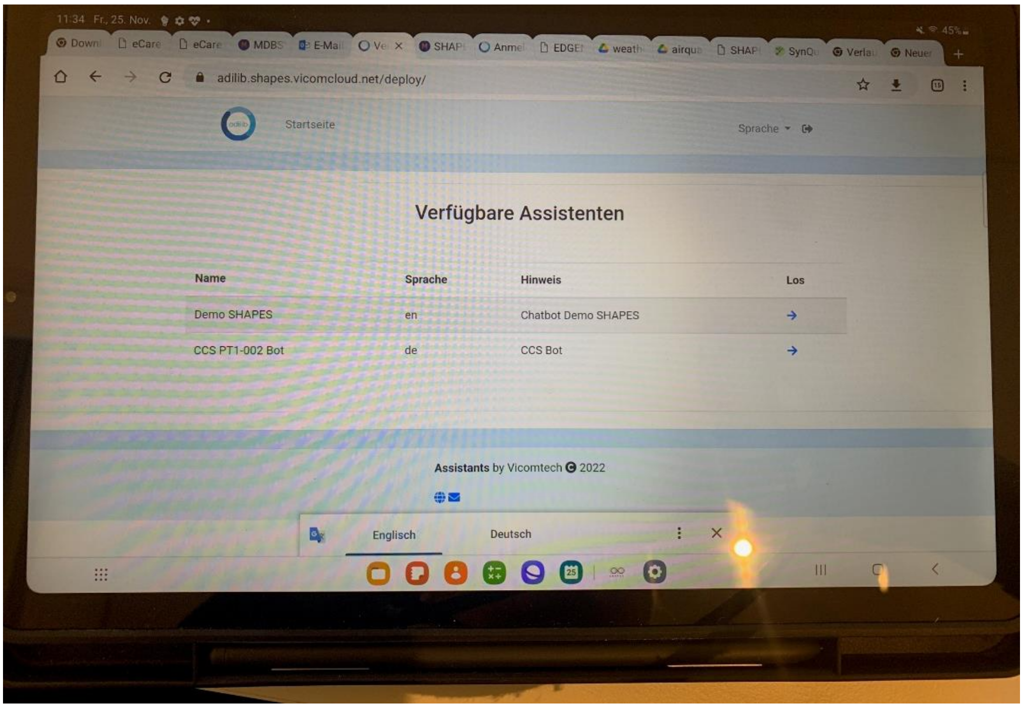

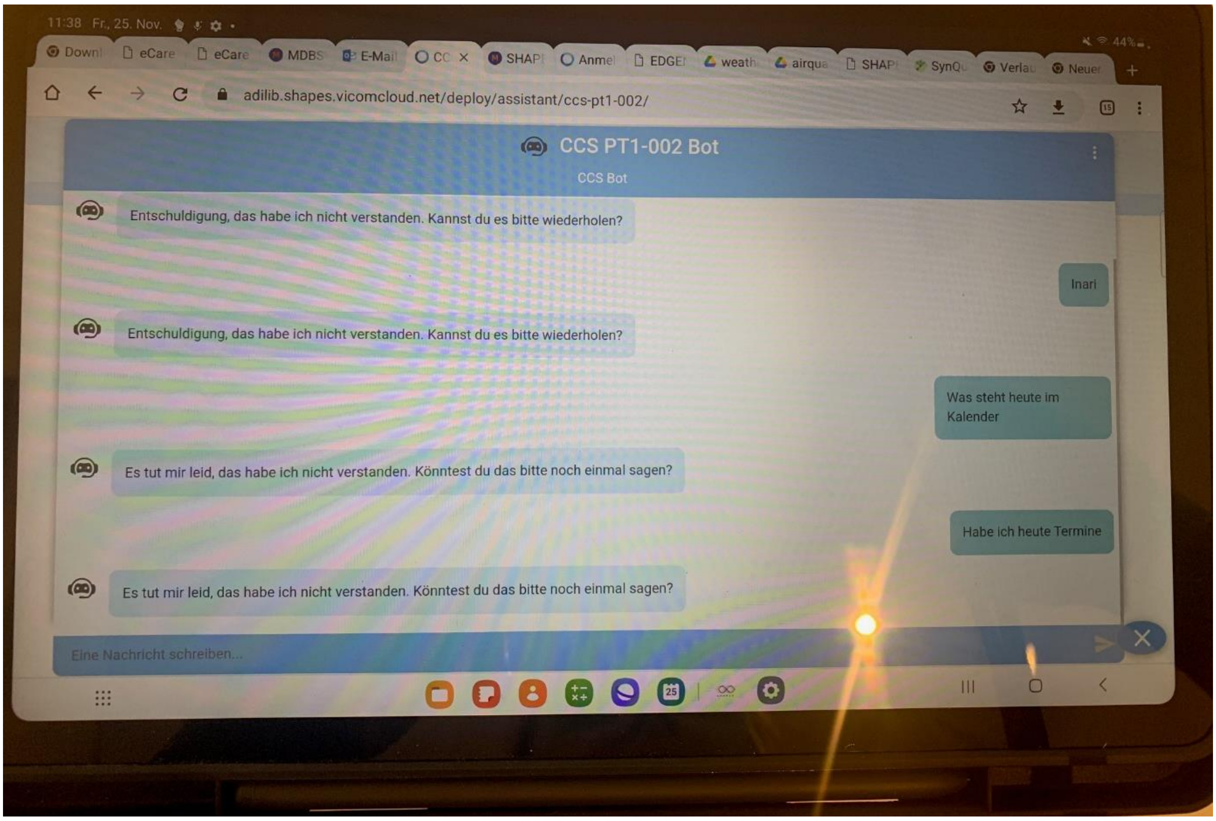

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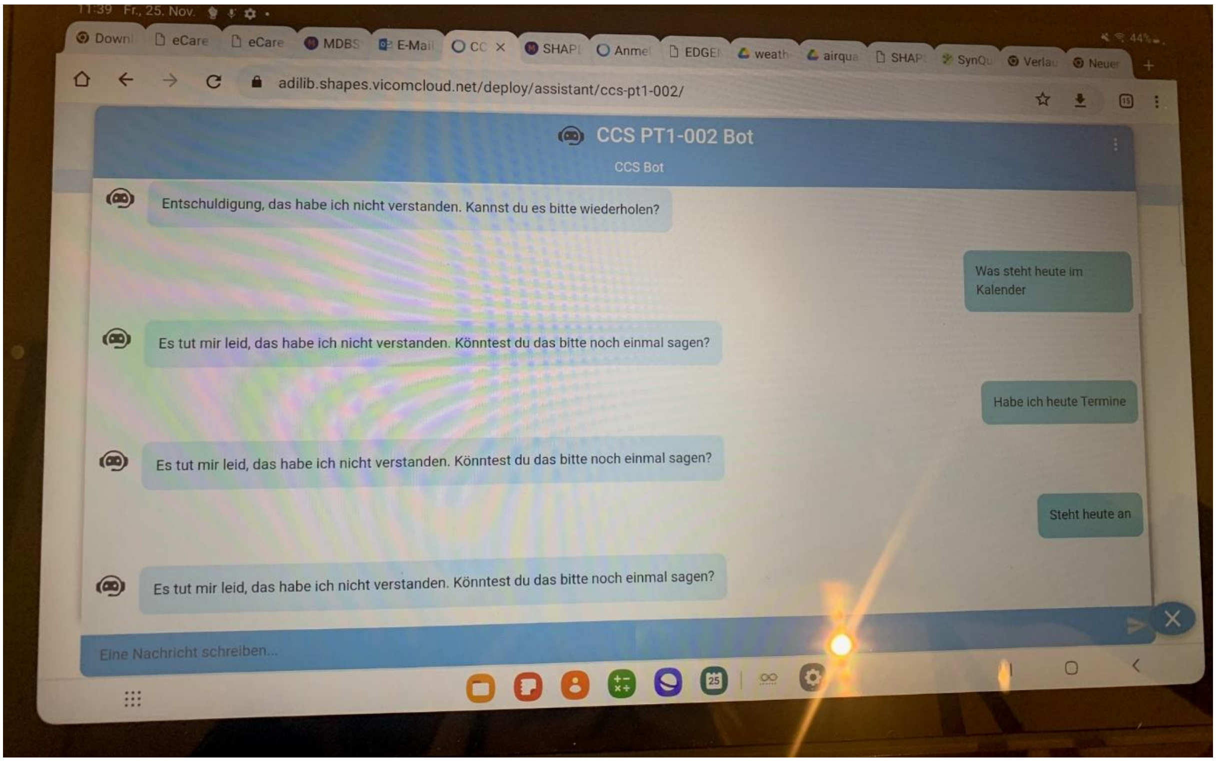

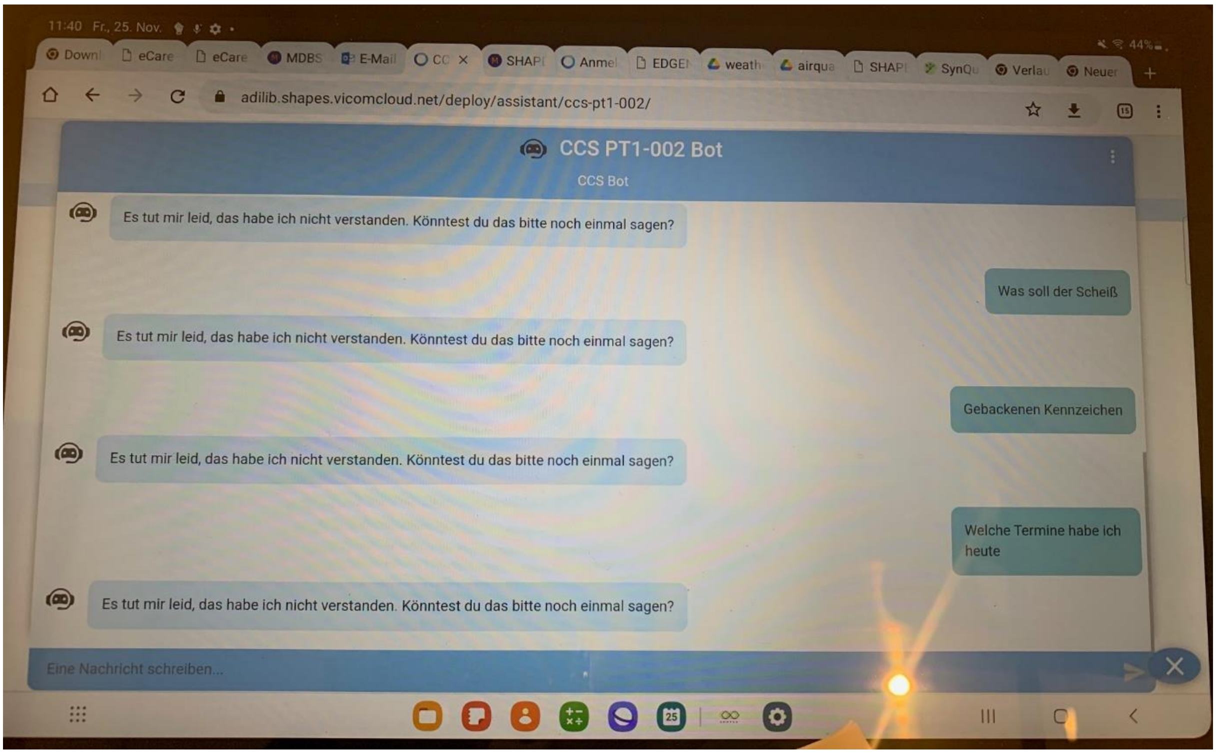

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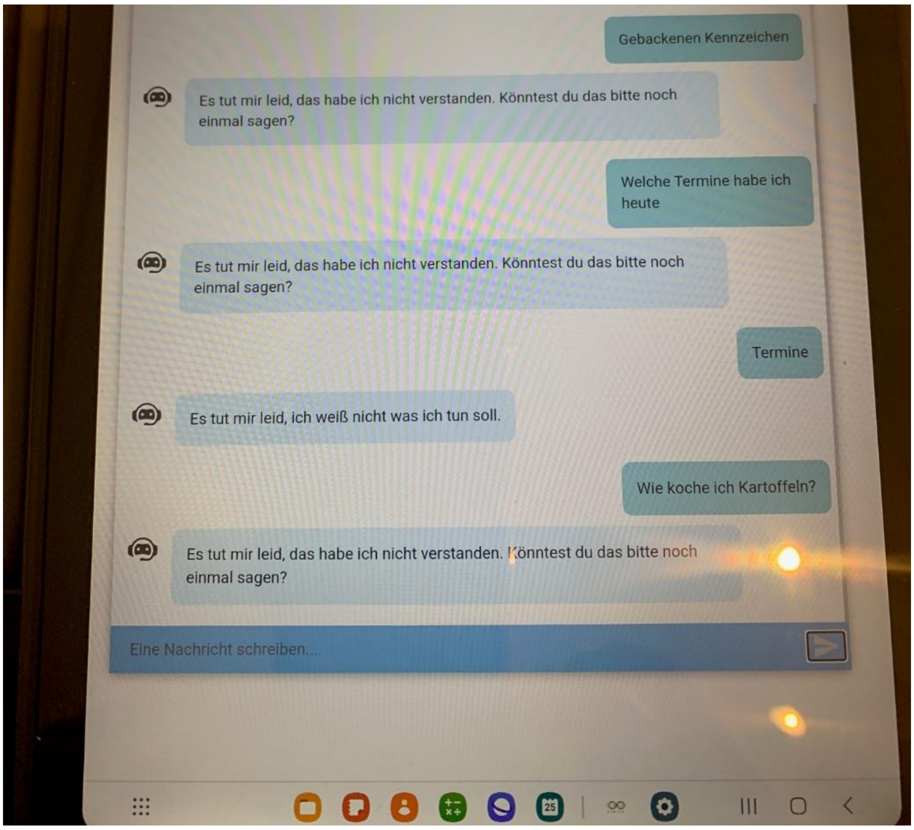
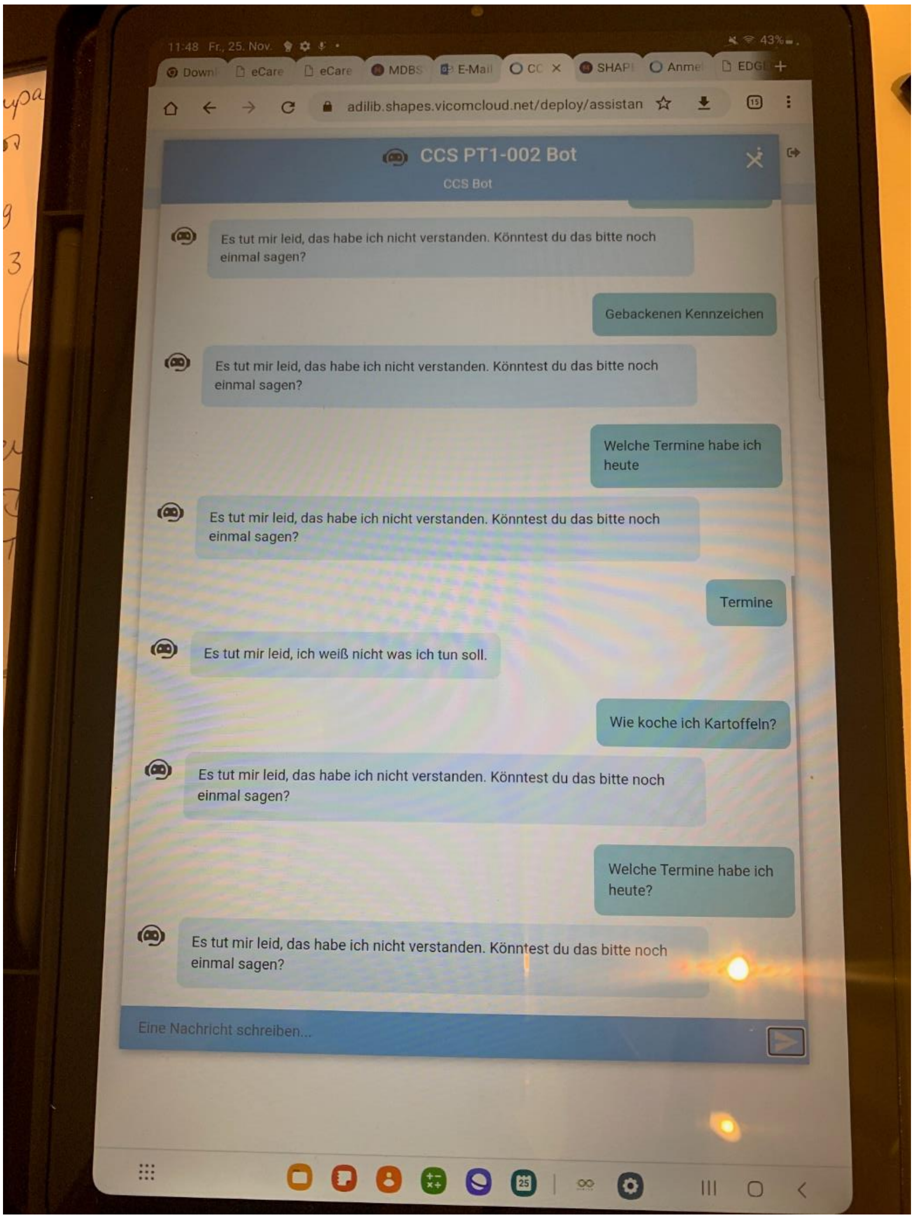

Gebackenen Kennzeichen
Es tut mir leid, das habe ich nicht verstanden. Könntest du das bitte noch einmal sagen?
Welche Termine habe ich heute
Es tut mir leid, das habe ich nicht verstanden. Könntest du das bitte noch einmal sagen?
Termine
Es tut mir leid, ich weiß nicht was ich tun soll.
Wie koche ich Kartoffeln?
Es tut mir leid, das habe ich nicht verstanden. Könntest du das bitte noch einmal sagen?
Eine Nachricht schreiben...



- unsatisfactory result

- the digital assistant does not react to activation sentences

- the digital assistant does not understand Hey Nari

- no reaction hearing and writing

- planning meeting with VICOM to find possible solutions

28.11.2022

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- meeting with VICOM at 10am:

- “Hey Nari” is just the activate sentence – after hearing a “ping” – the DA is ready – “Hey Nari” not write down in the chatbot

- problem just only in German – because of the capital letters (?)

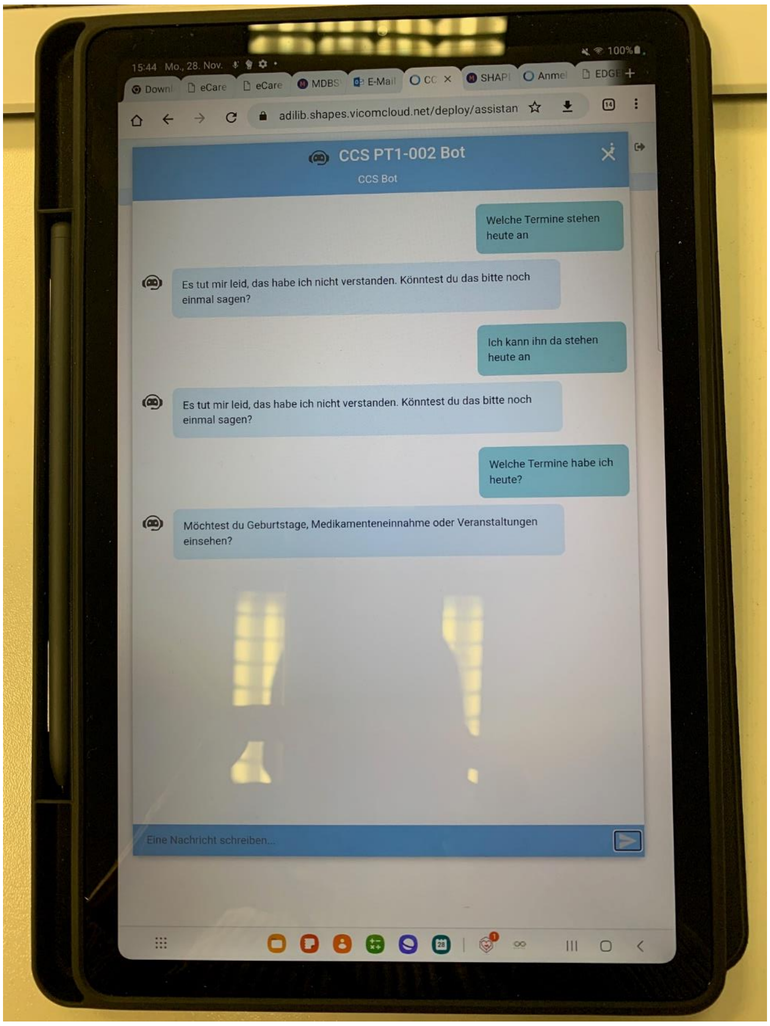
- VICOM will test the activation sentences from every skill

Internal test 28.11.2022; at 15:40

Login worked

Activate the DA with „Hey Nari“ worked – “Ping” can be heard.

Voice/speech recognition very difficult, worked just only one time:



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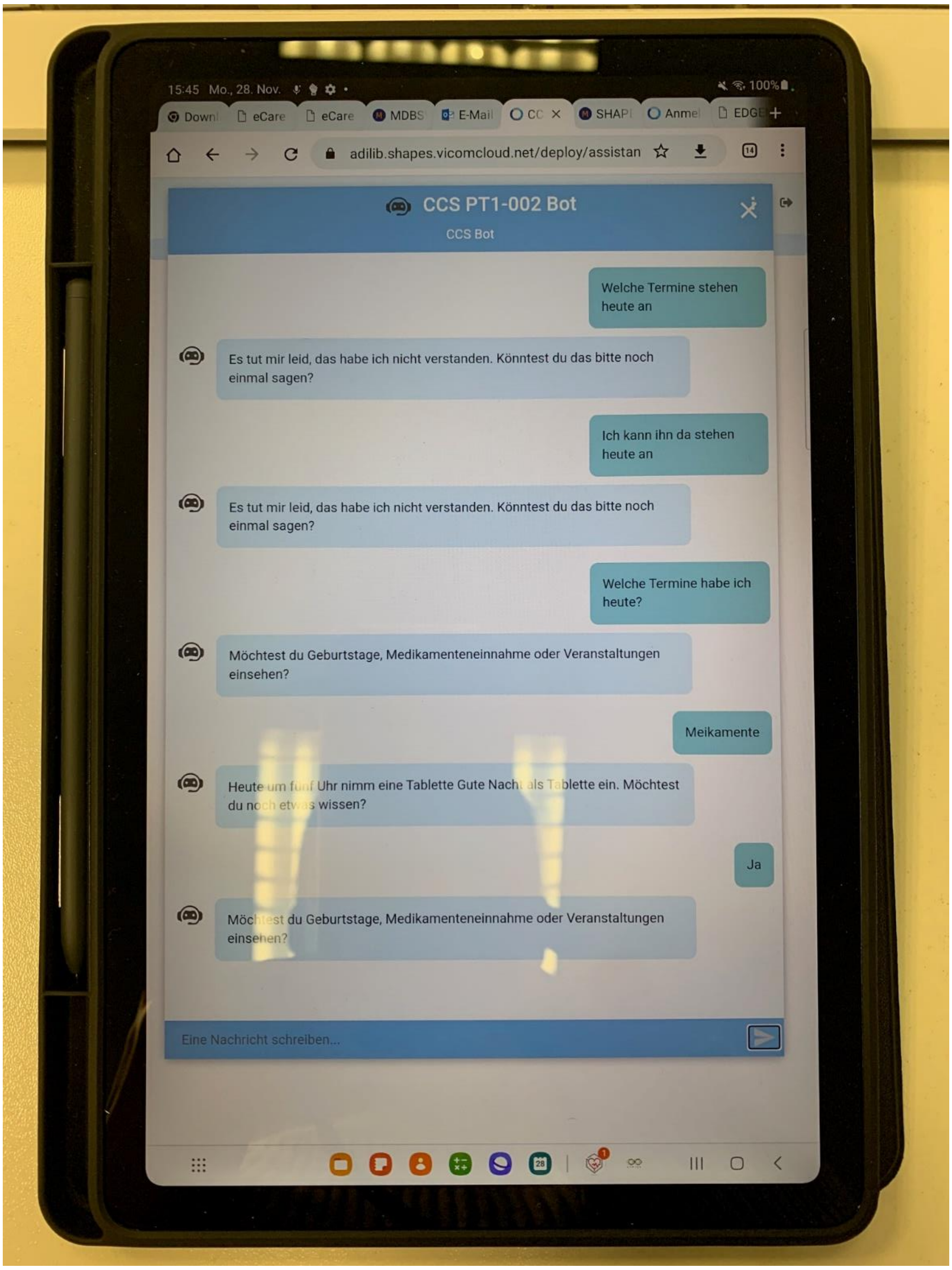
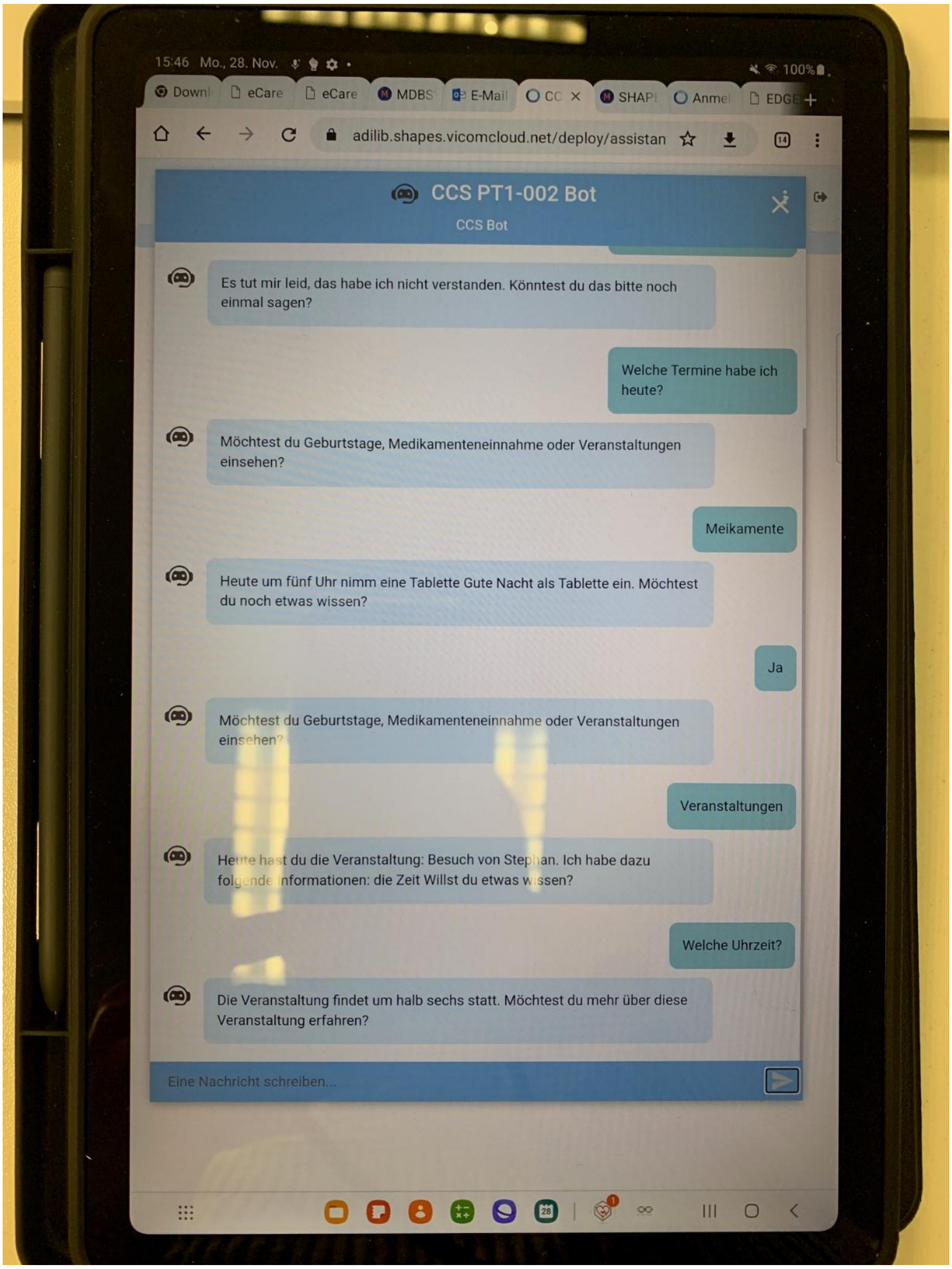
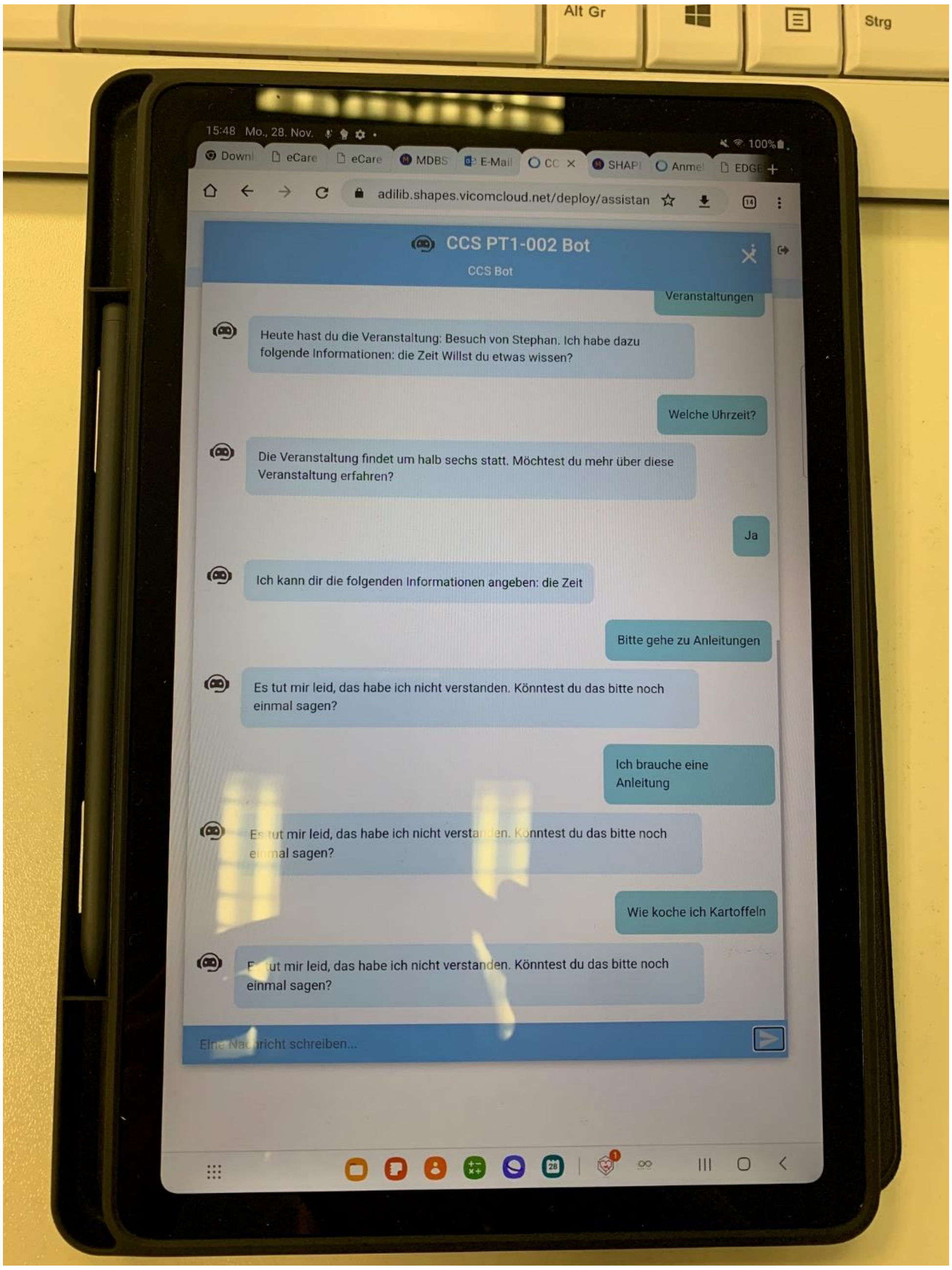
Rest of the communication only possible by text:




15:46 Mo., 28. Nov.
100%
adilib.shapes.vicomcloud.net/deploy/assistan
CCS PT1-002 Bot
CCS Bot
Es tut mir leid, das habe ich nicht verstanden. Könntest du das bitte noch einmal sagen?
Welche Termine habe ich heute?
Möchtest du Geburtstage, Medikamenteneinnahme oder Veranstaltungen einsehen?
Meikamente
Heute um fünf Uhr nimm eine Tablette Gute Nacht als Tablette ein. Möchtest du noch etwas wissen?
Ja
Möchtest du Geburtstage, Medikamenteneinnahme oder Veranstaltungen einsehen?
Veranstaltungen
Heute hast du die Veranstaltung: Besuch von Stephan. Ich habe dazu folgende Informationen: die Zeit Willst du etwas wissen?
Welche Uhrzeit?
Die Veranstaltung findet um halb sechs statt. Möchtest du mehr über diese Veranstaltung erfahren?
Eine Nachricht schreiben...

but activate tutorials was not possible about it either :



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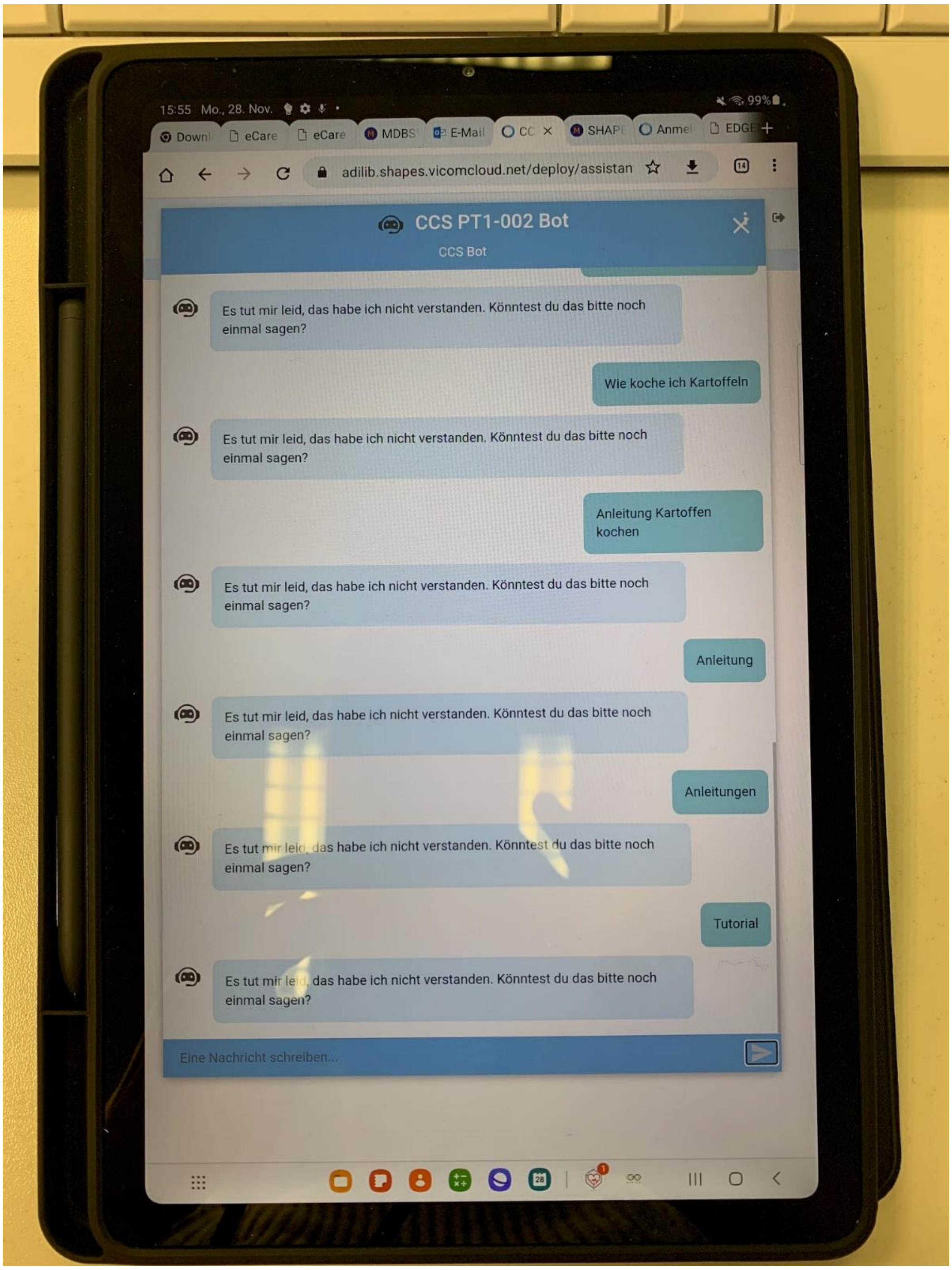

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Annex 26

UC-PT1-002 Test Dates Phase 4

USER	SHAPES20		worked? yes/no	notes
general agenda overview				
birthdays				
Erna	28.11.2022		yes	speech doesn’t work
Inge	02.12.2022		yes	speech doesn’t work
Thomas	09.12.2022		yes	speech doesn’t work
doctor appointments				
Blutabnahme	29.11.2022	14:30	yes	
Belastungs-EKG	06.12.2022	10:00	yes	
other appointments				
Friseurtermin	30.11.2022	15:00	yes	
Baustellenbesichtigung	05.12.2022	12:00	yes	
drug intake				
	28.11.-09.12.22	08:30	yes	
	28.11.-09.12.22	17:00	yes	
reminders				only works, when assistant is opened in browser. Past appointments are not reminded - If a time window is missed (e.g. device not

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				switched on), there is no reminder.
birthdays	02.12.2022	12:00	yes	
doctor appointments	06.12.2022	09:00	no	
other appointments	30.11.2022	14:00	yes	
drug intake				
morning	01.12.2022	08:00	no	
	07.12.2022	08:00	no	
	09.12.2022	08:00	yes	
evening	29.11.2022	16:30	yes	
	06.12.2022	16:30	no	
	02.12.2022	16:30	no	
questionnaire				
Fragebogen Morgen	08.12.2022	10:00	yes	
Fragebogen Abend	05.12.2022	16:00	yes	

USER	SHAPES21		worked? yes/no	notes
general agenda overview				
birthdays				
Max	28.11.2022		yes	speech doesn't work
Lilo	30.11.2022		yes	speech doesn't work
Stephan	06.12.2022		yes	speech doesn't work
doctor appointments				
Blutabnahme	30.11.2022	11:30	yes	
Belastungs-EKG	07.12.2022	11:30	yes	
other appointments				

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Besuch von Stephan	28.11.2022	18:30	yes	
Friseurtermin	05.12.2022	10:00	yes	
Sport	08.12.2022	12:00	yes	
drug intake				
	28.11.-09.12.22	08:30	yes	
	28.11.-09.12.22	17:00	yes	
reminders				only works, when assistant is opened in browser. Past appointments are not reminded - If a time window is missed (e.g. device not switched on), there is no reminder.
birthdays	06.12.2022	12:00	yes	
doctor appointments	07.12.2022	10:30	yes	
other appointments	08.12.2022	11:00	yes	
drug intake				
morning	30.11.2022	08:00	no	
	05.12.2022	08:00	no	
	07.12.2022	08:00	yes	
evening	01.12.2022	16:30	yes	
	05.12.2022	16:30	yes	
	08.12.2022	16:30	yes	
questionnaire				
Fragebogen Morgen	06.12.2022	10:00	no	
Fragebogen Abend	05.12.2022	16:00	yes	

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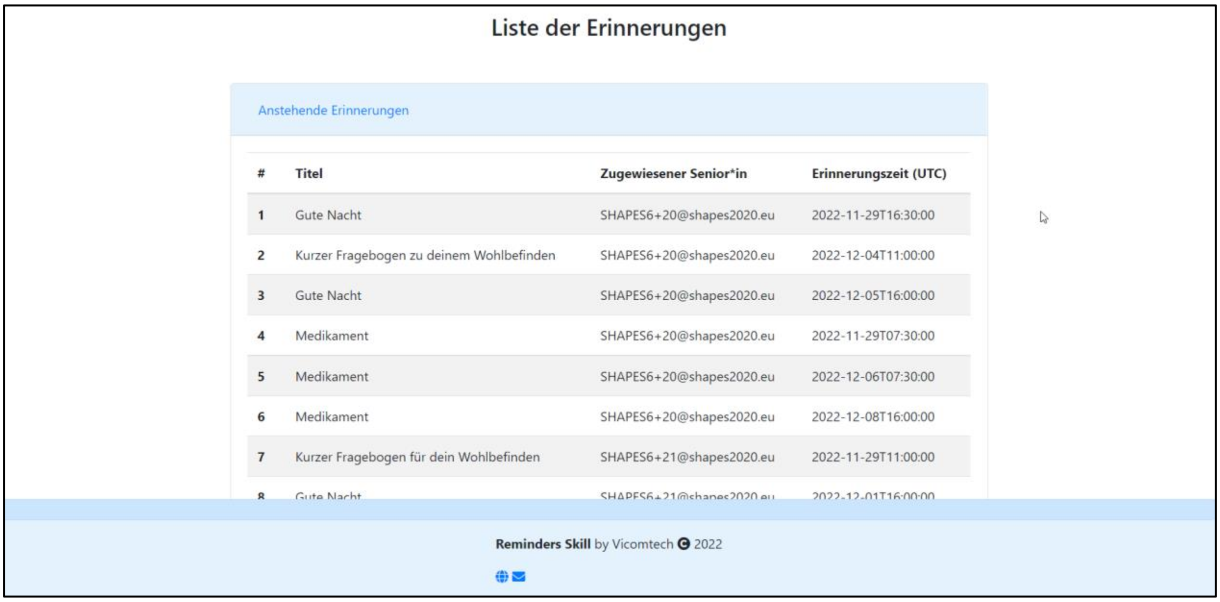
Annex 27

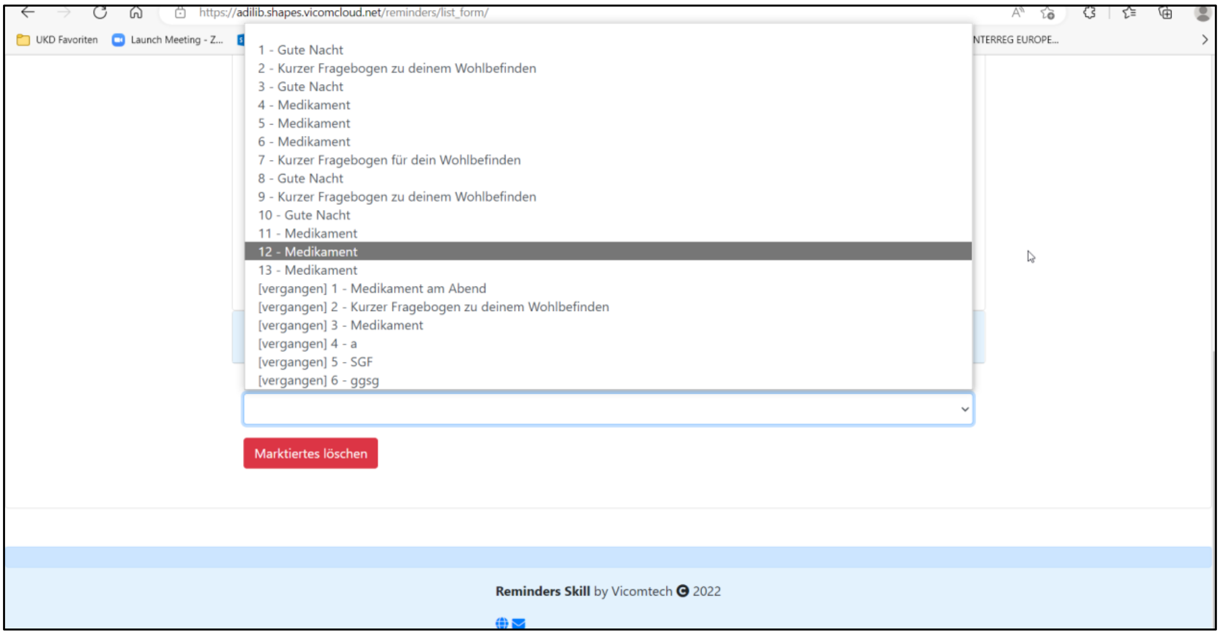
UC-PT1-002 Feedback for technical partners

General feedback

Poor structure of the reminder-overview. It is not differentiated between the individual user, also there is no way to filter the results:



No way to mark the reminders → everything has to be done individually



8

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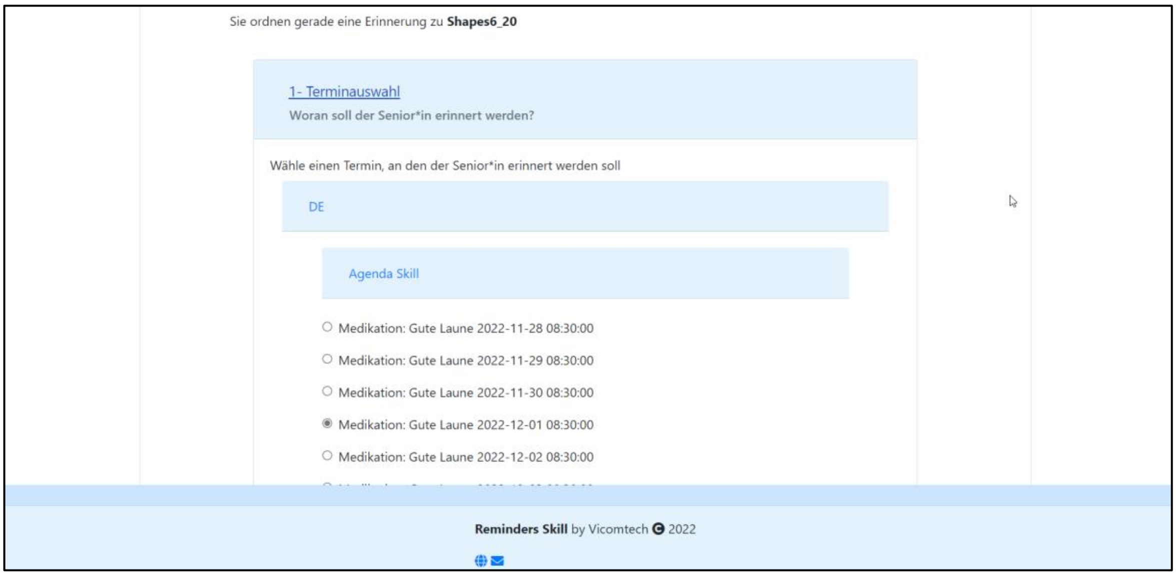
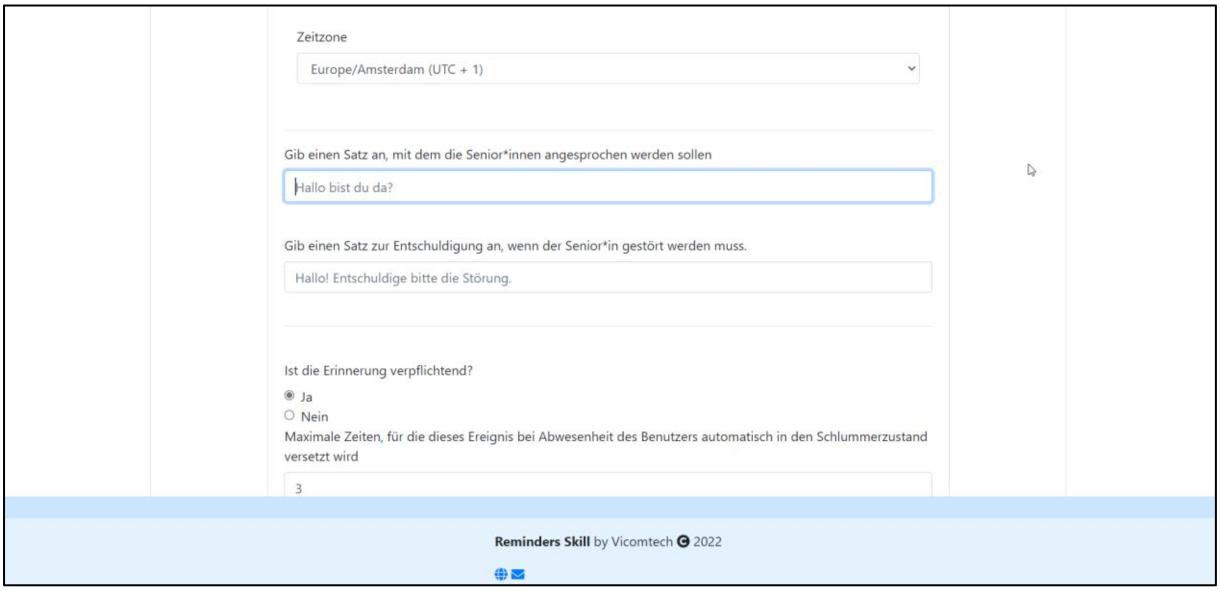
No way to create reminders for a series of appointments. Everything has to be done individually. It would be helpful to be able to create reminders for frequent events all at once.



--> With this issue also the reminder configuration is too elaborate / extensive. In addition, these are all mandatory field, but re not marked as such:



No way to edit existing reminders (delete or create only)

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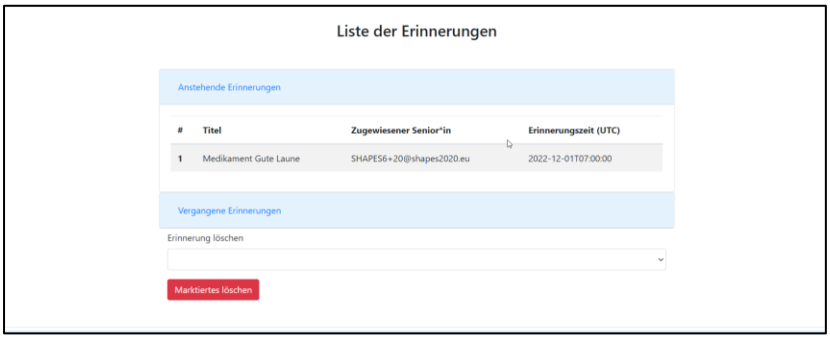
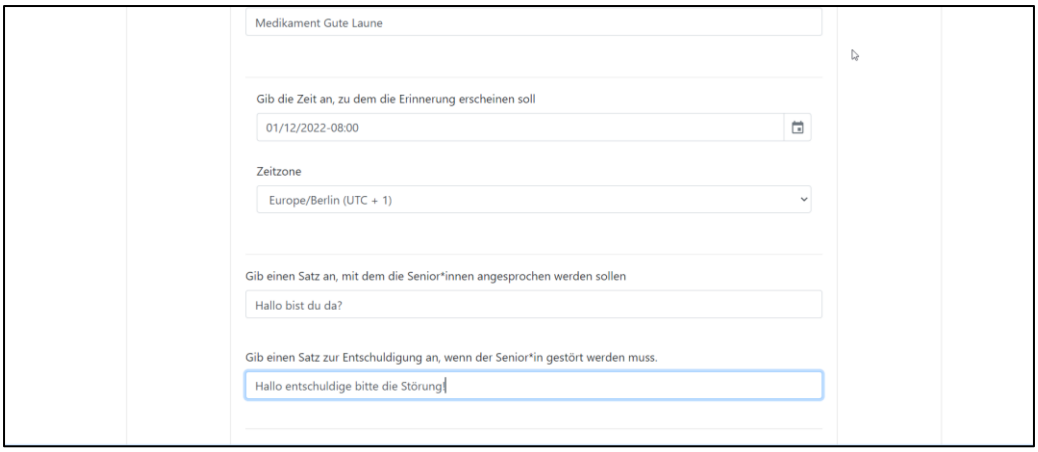


<u>Reminder should be set at 8am (German time)</u>

→ does not work. (FYI: the numbering of the following issues is corresponding to the numbering of the created reminders in the reminder-skill platform)

1) UTC+1 Amsterdam: reminder is set at 7am
2) UTC+2 Athens: reminder is set at 6am:

3) Even when choosing the time zone for Berlin (UTC+1, analogue to Amsterdam), it iss et at 7am:



4) Choosing wrong time zone (Dublin UTC), reminder is set at the desired 8am:

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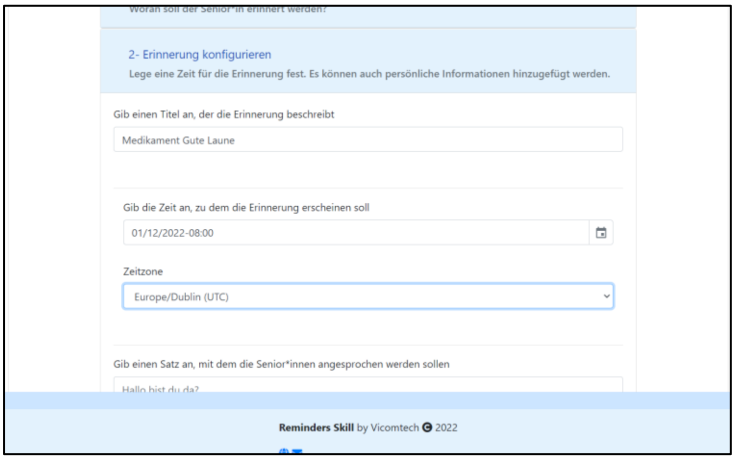
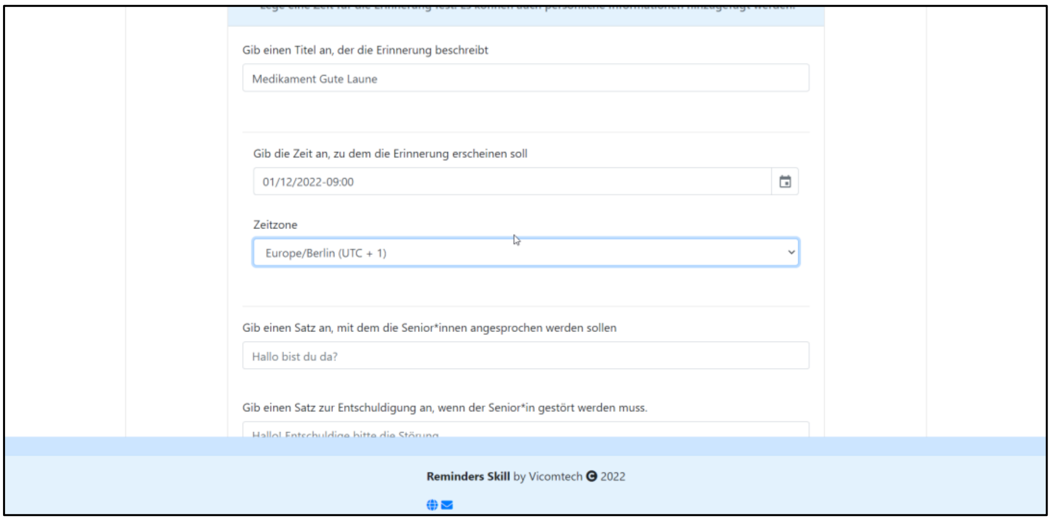


5) With Berlin time (UTC+1) reminder time has to be set at 9am, then it is saved at the desired 8am:



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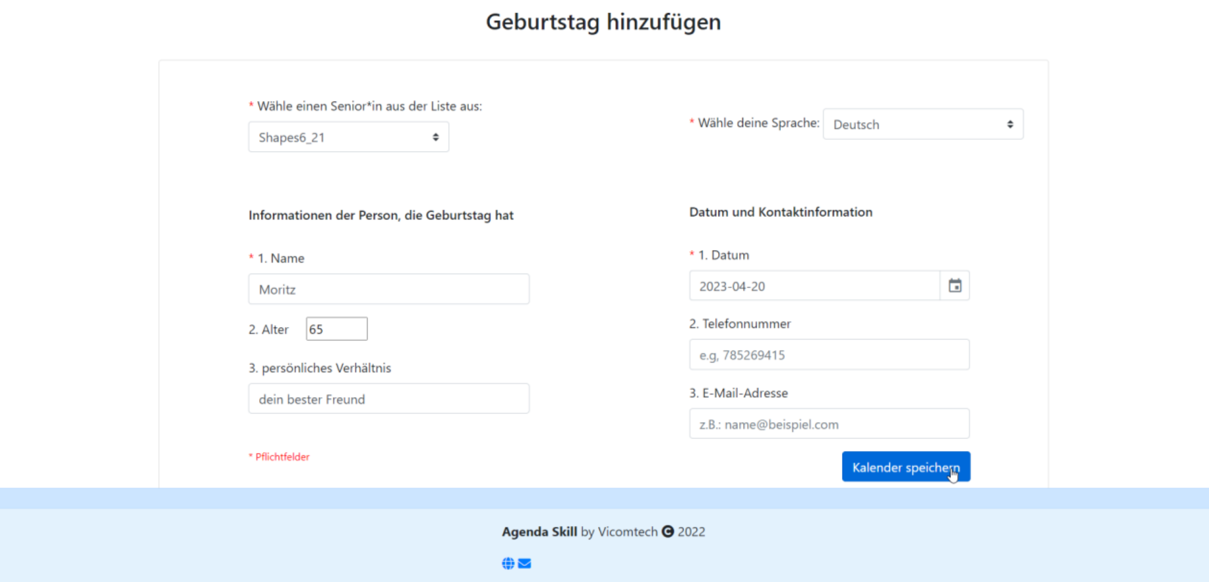
Annex 28

UC-PT1-002 Instruction manual for care givers

Instruction for care givers - using the digital assistant

Adding Birthdays



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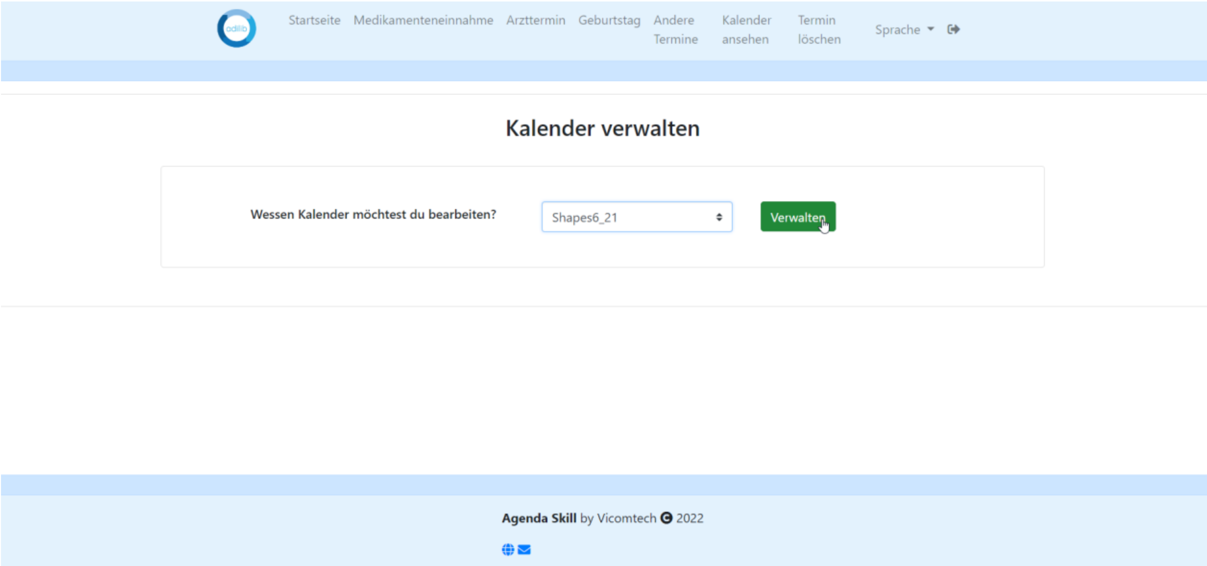

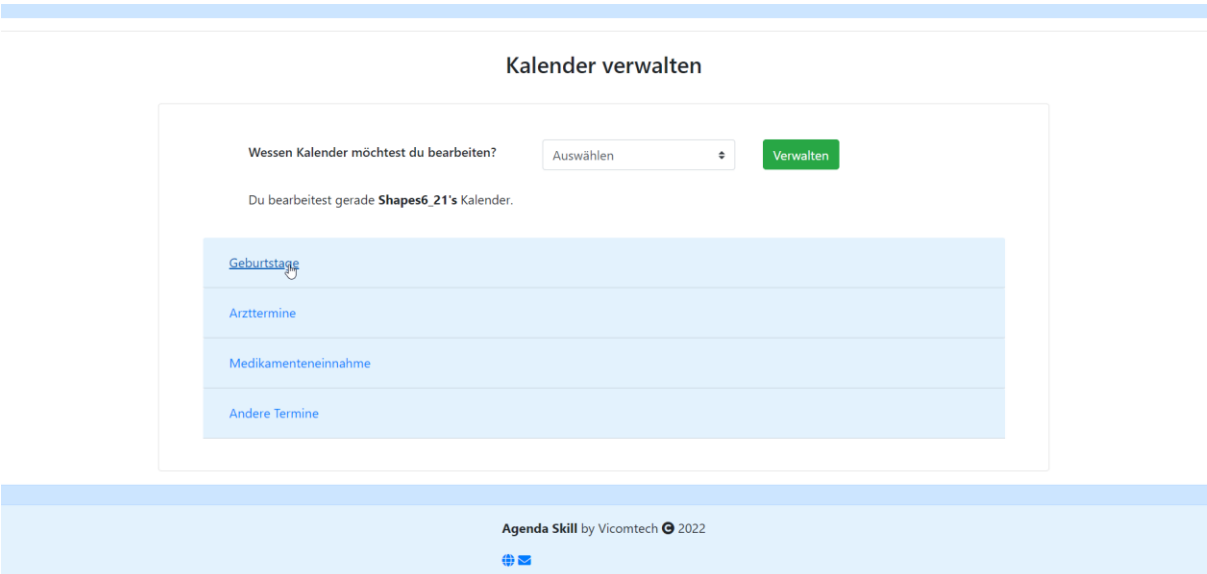

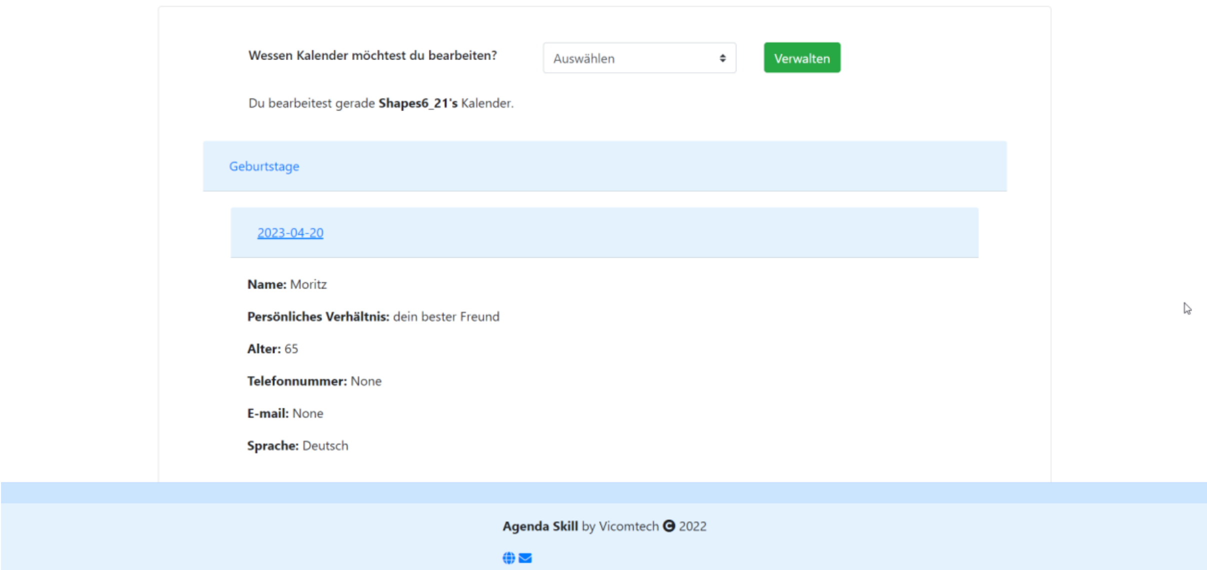

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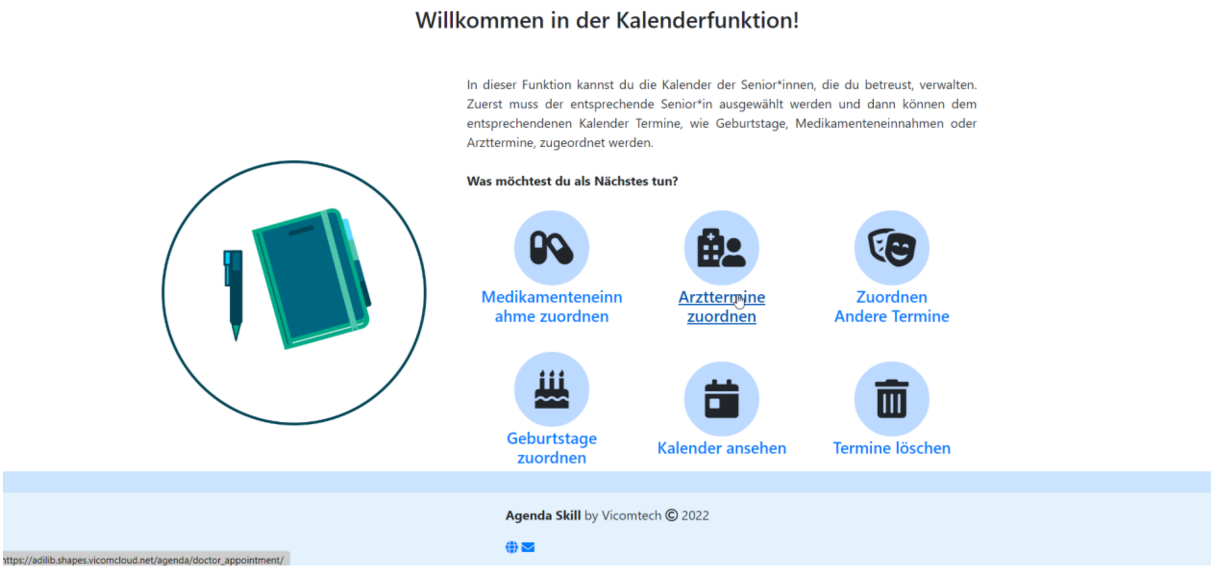
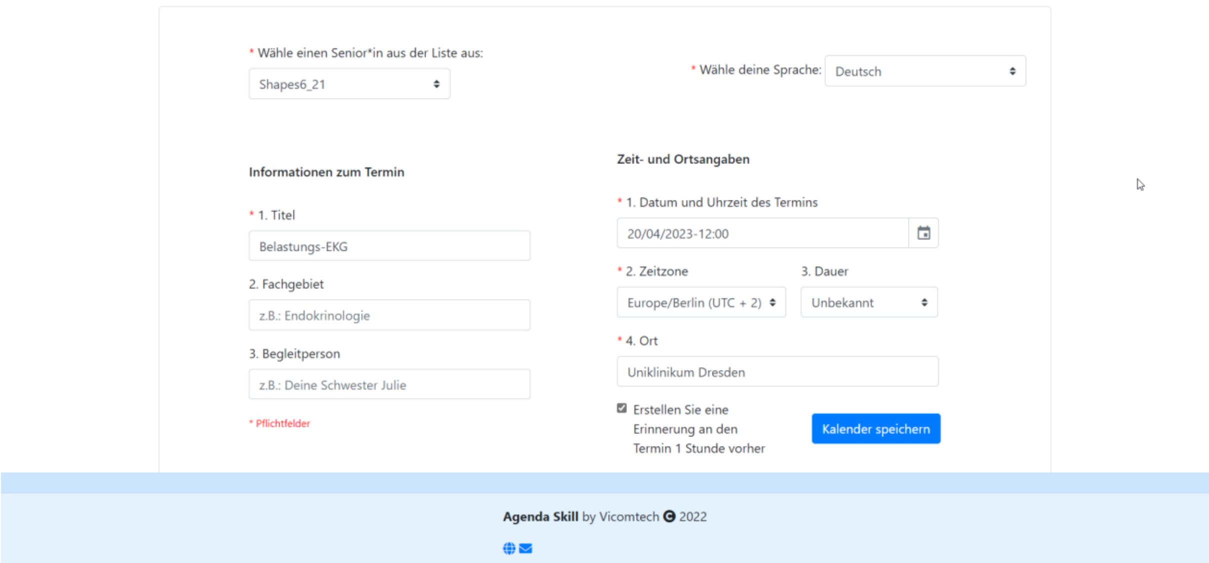
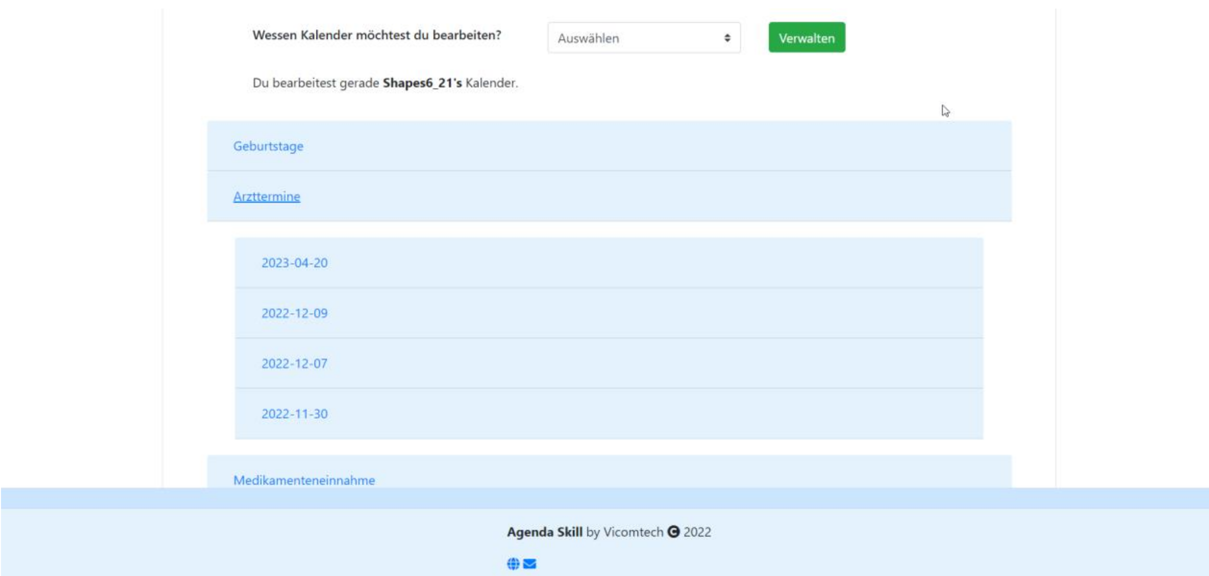
Create medical appointments







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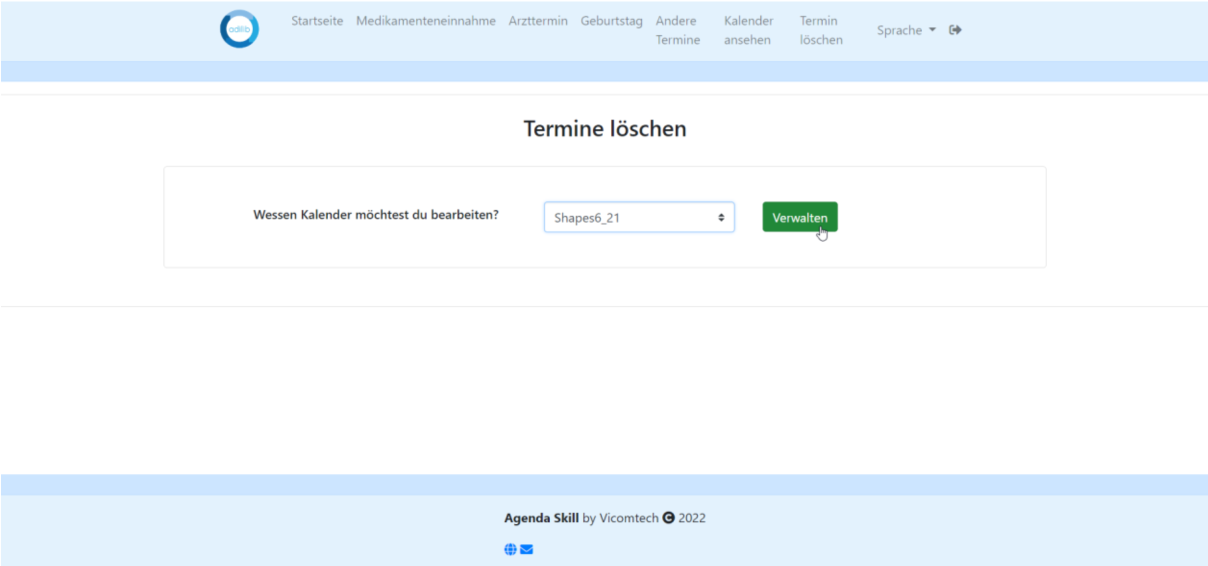
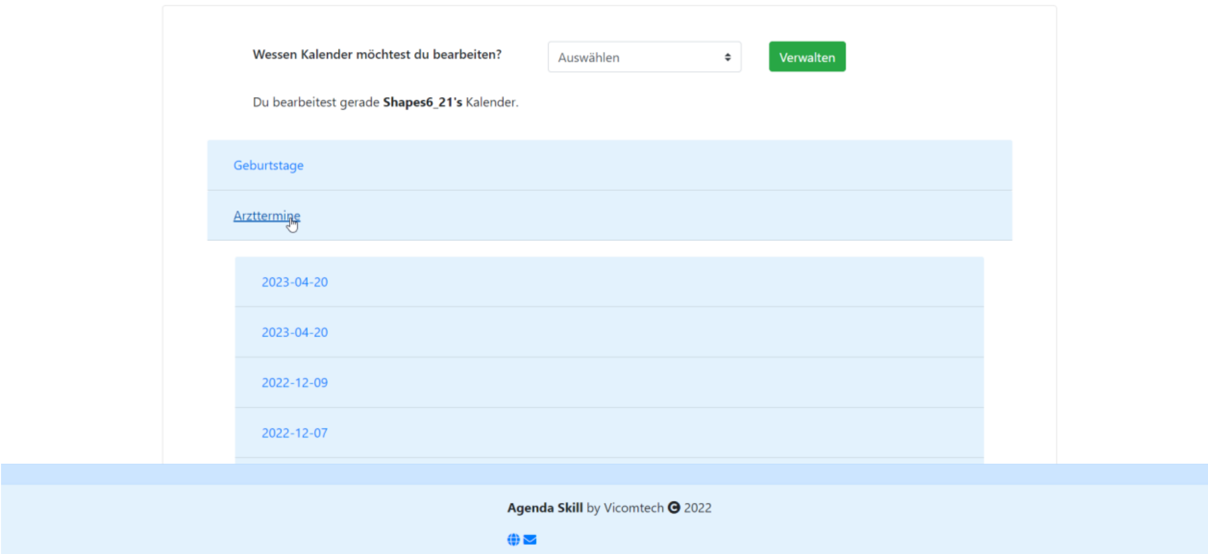
Delete appointments:





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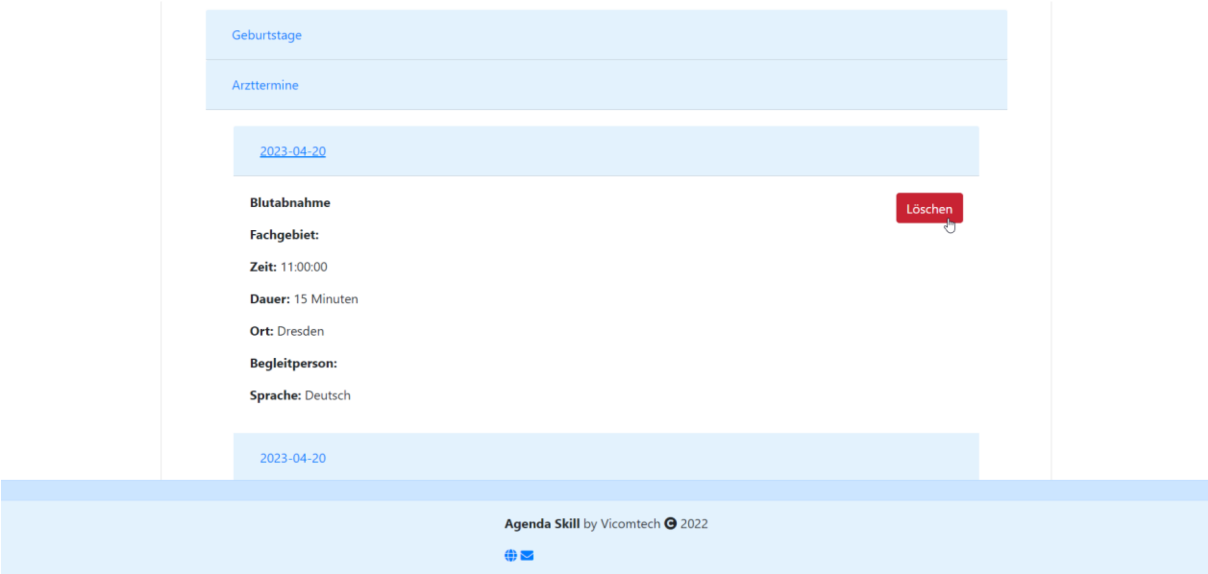

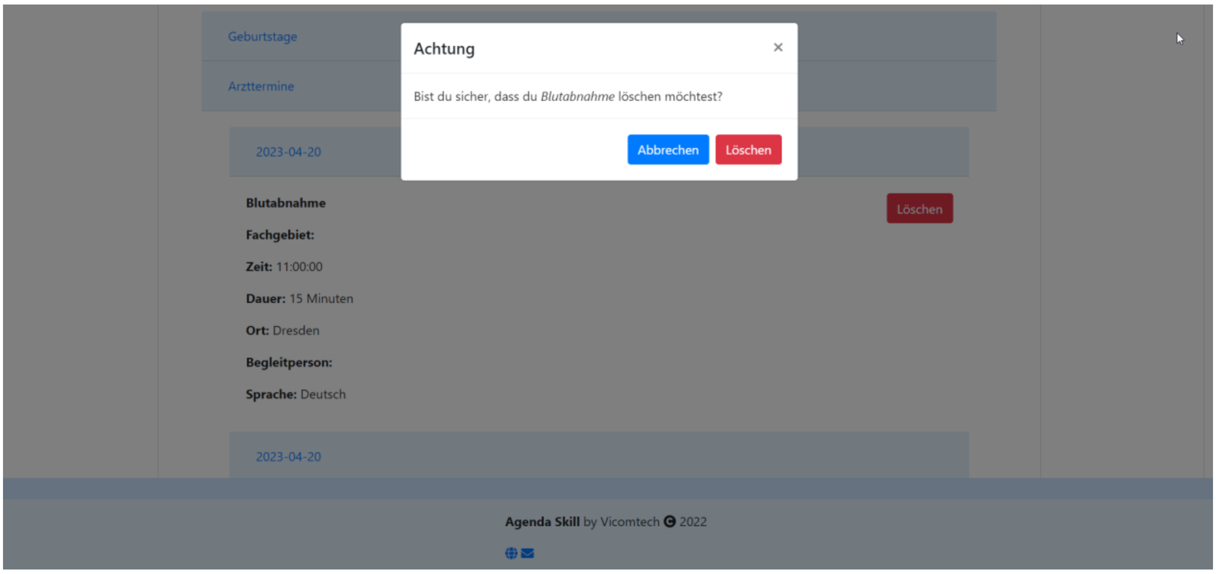

Create other appointments:

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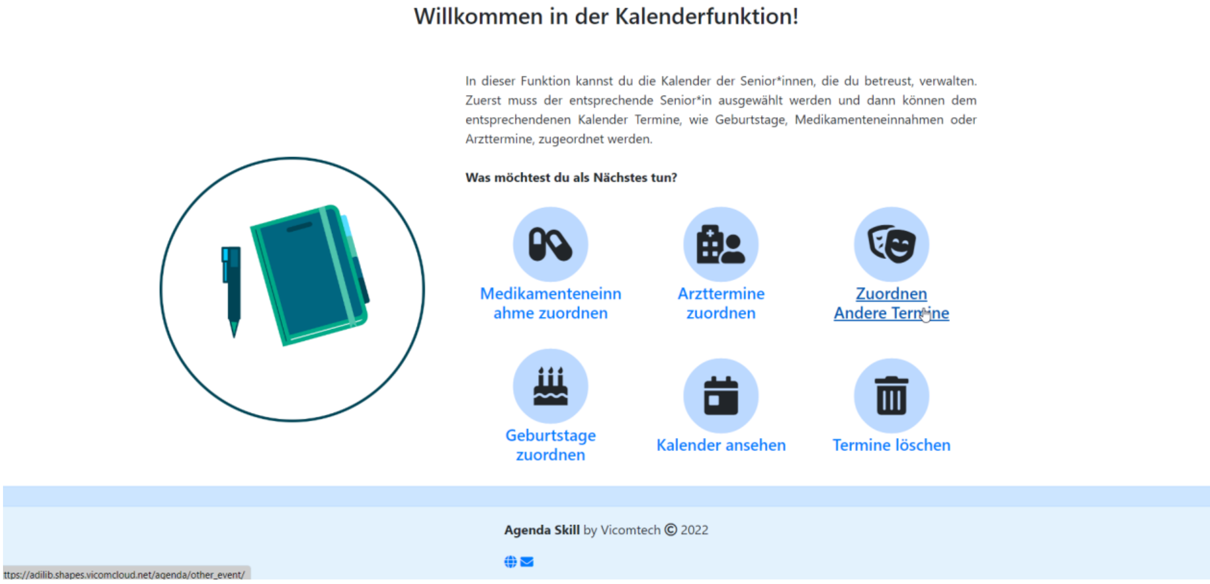

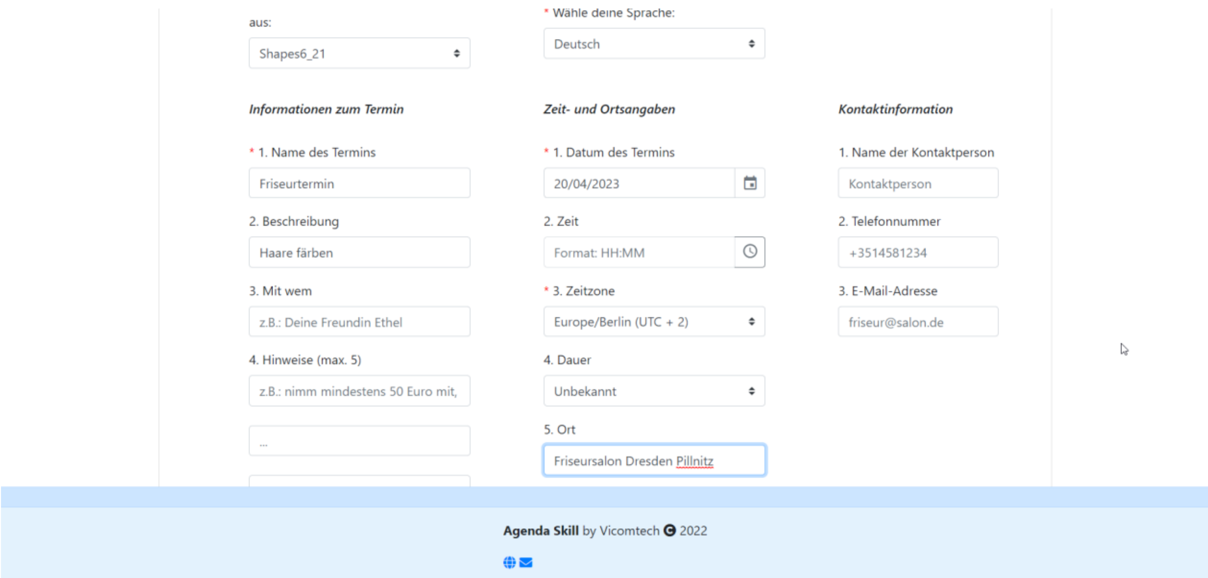

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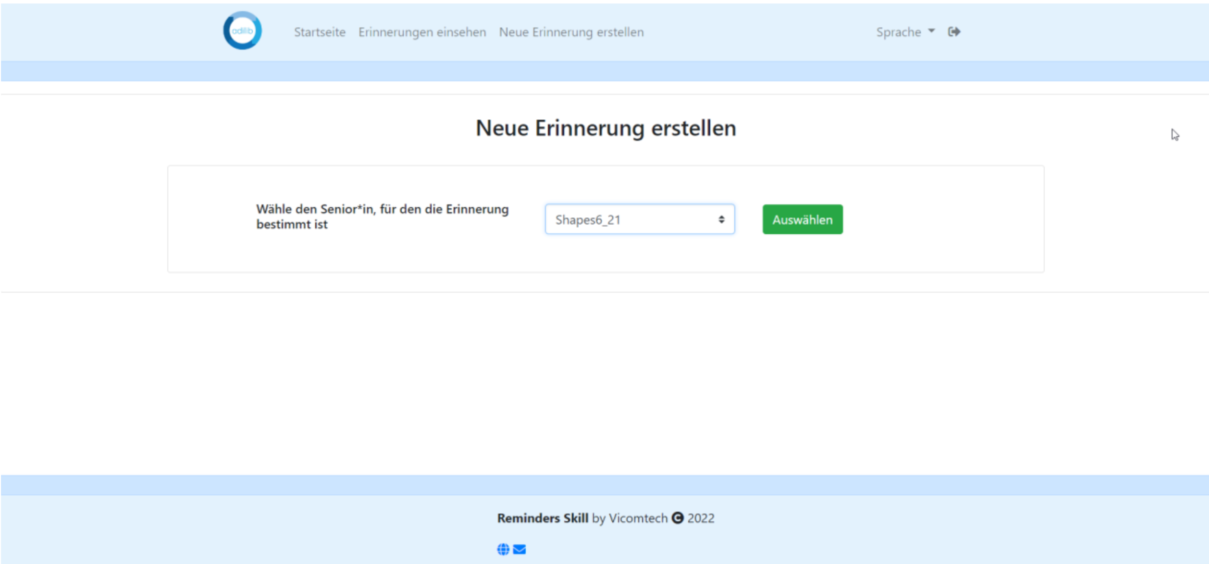
Create Reminders:



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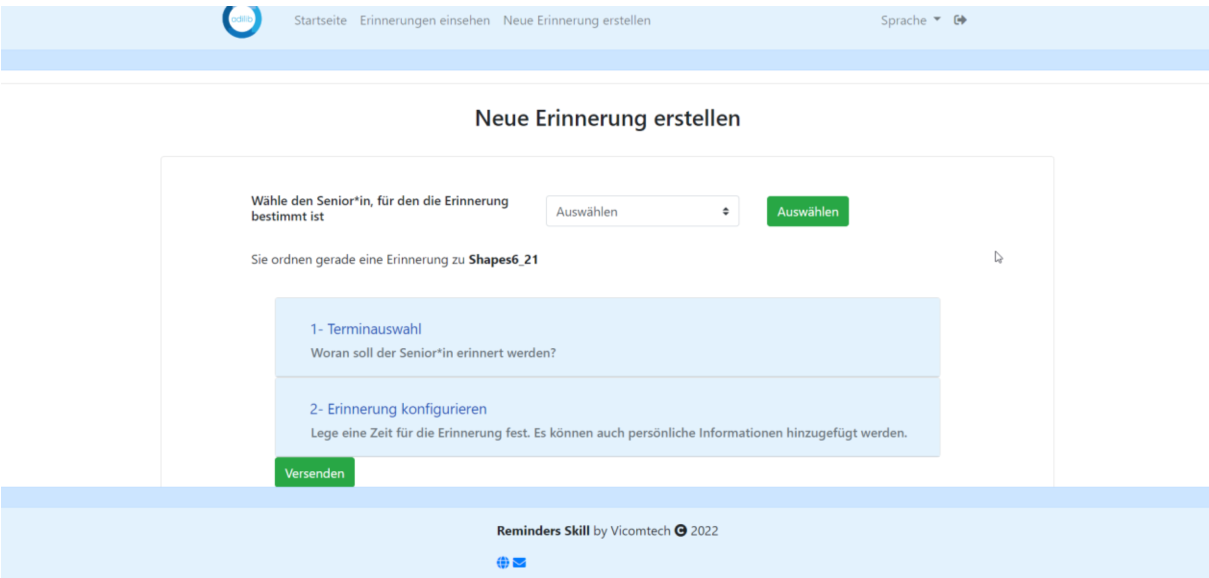

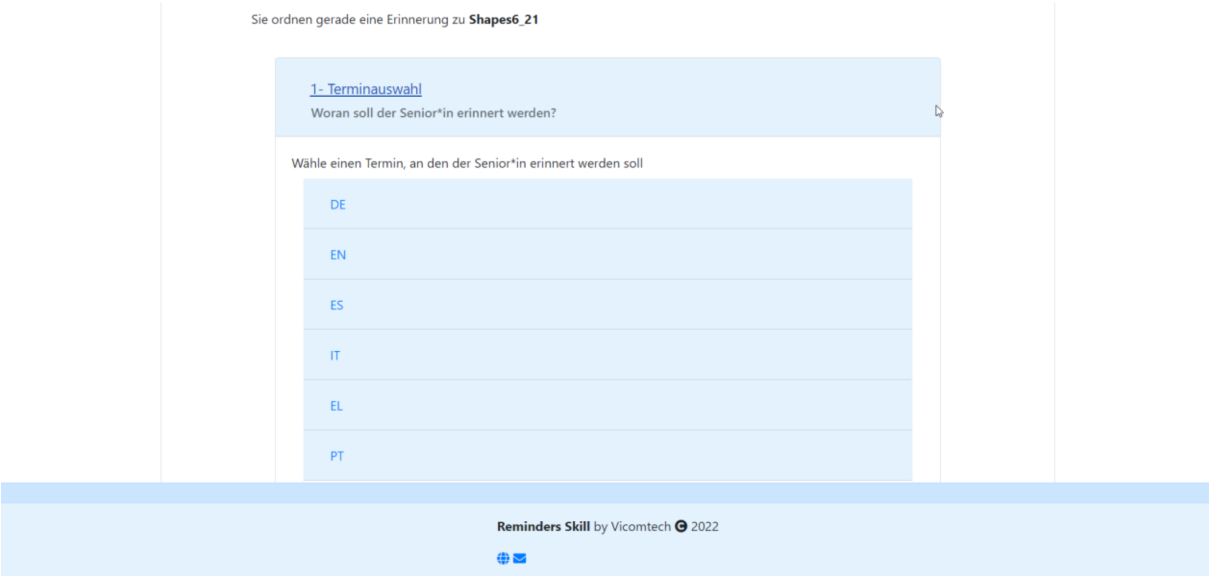

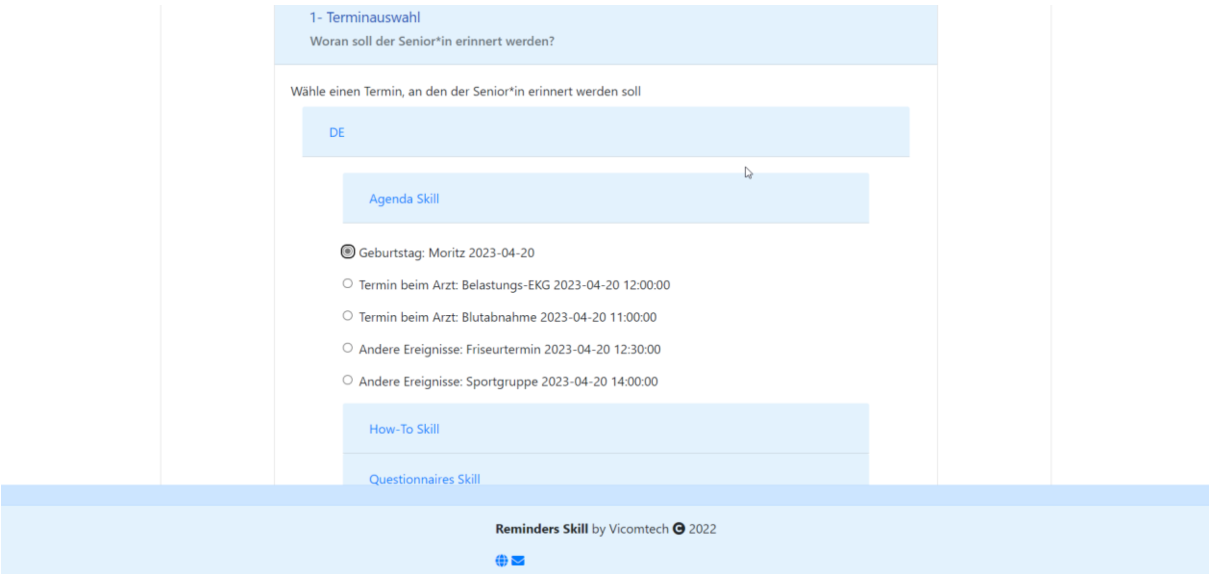

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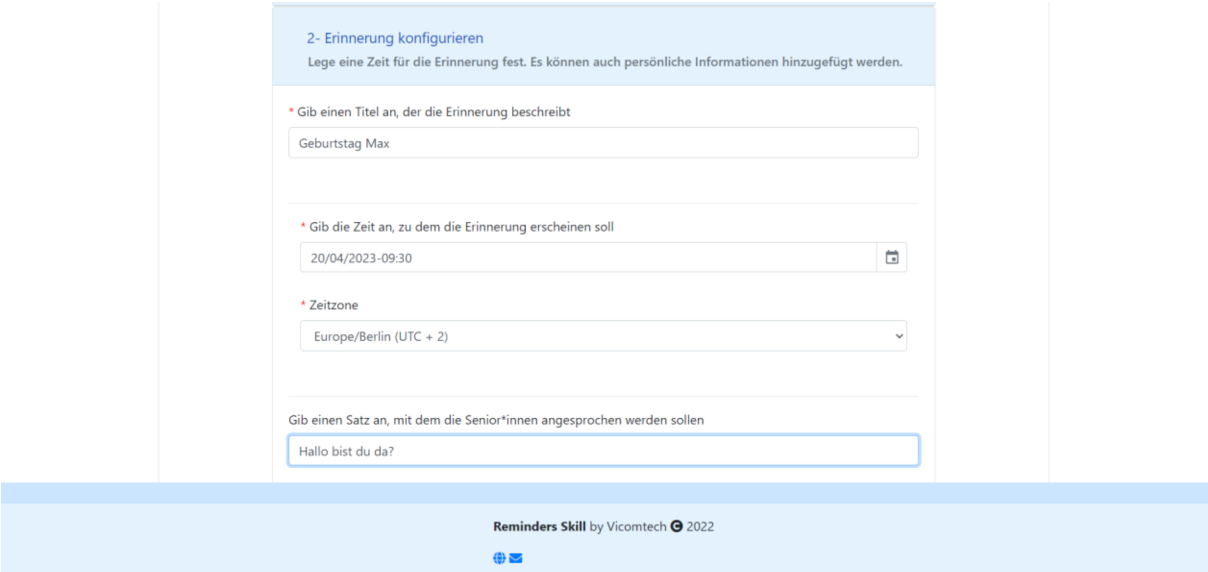

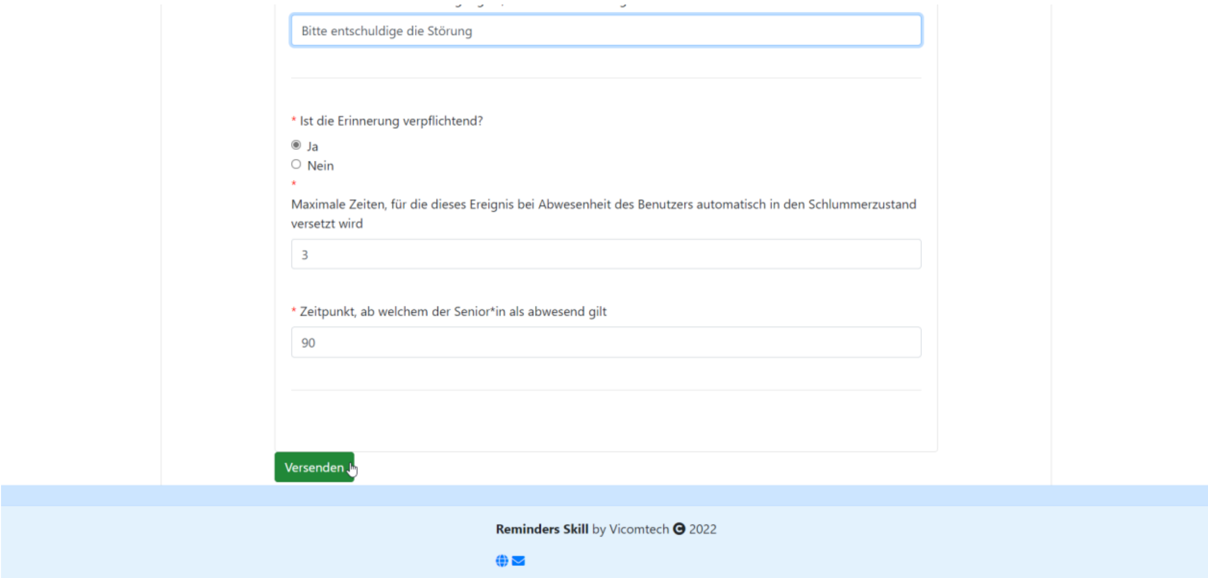

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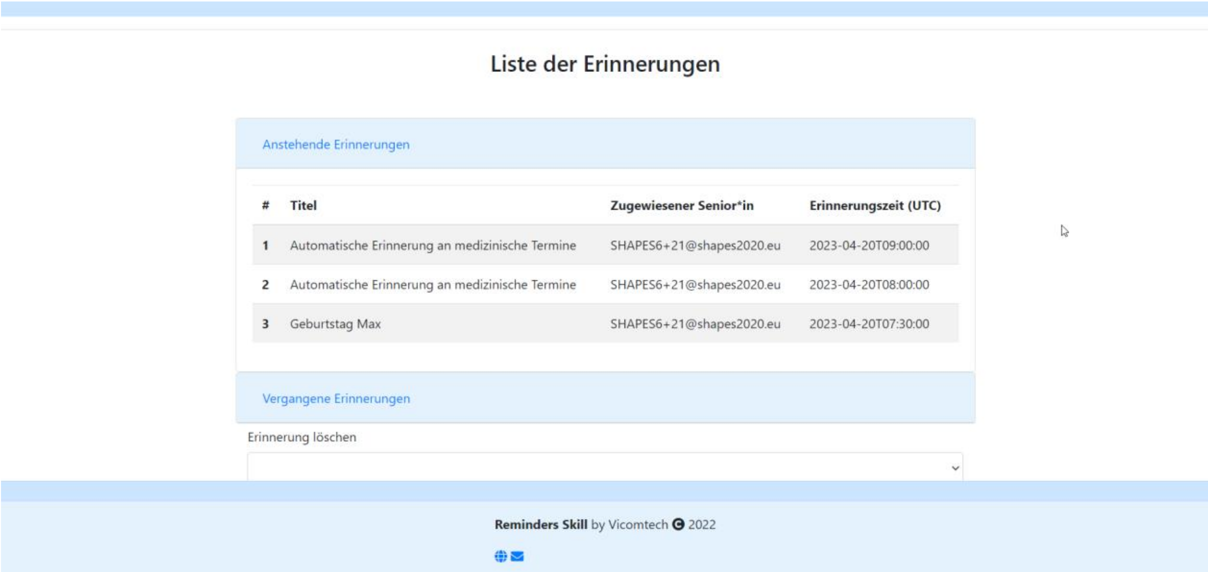
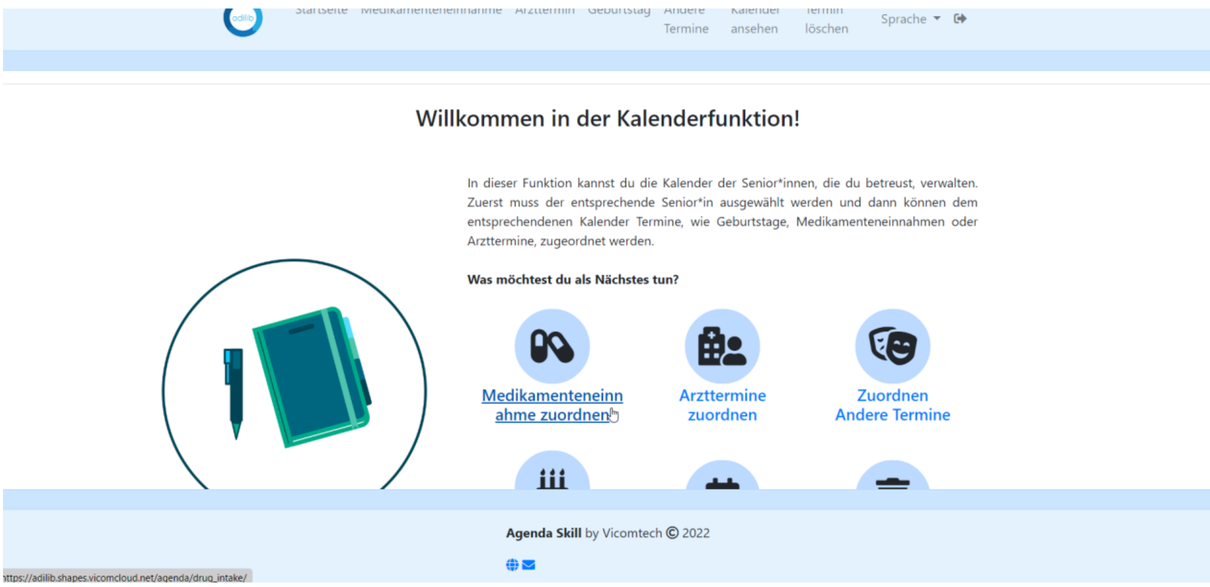


Medication intake:



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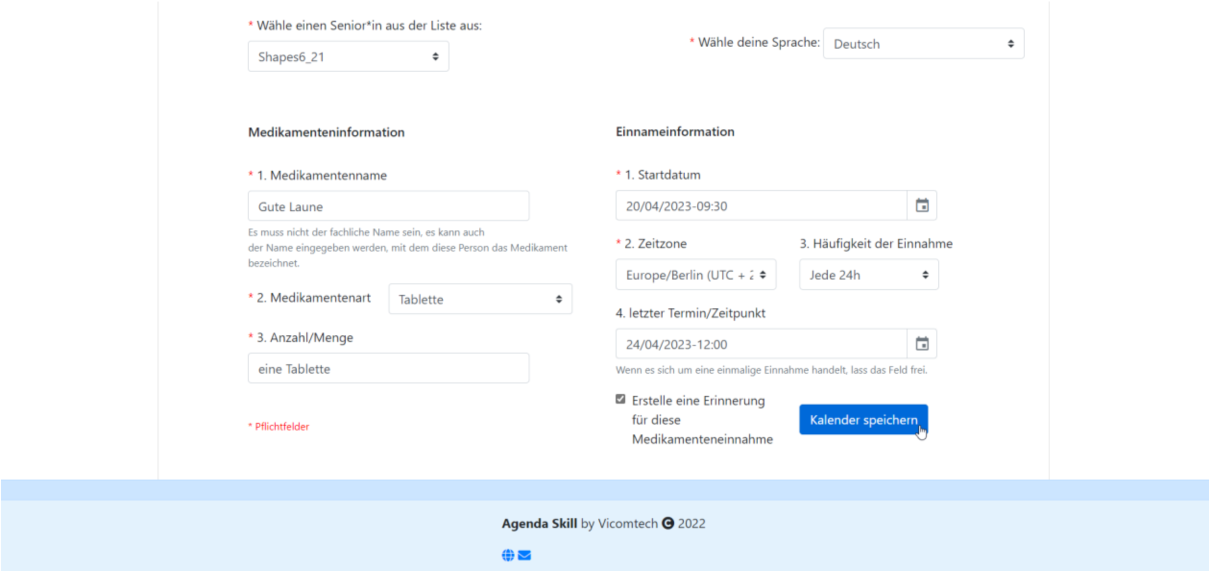

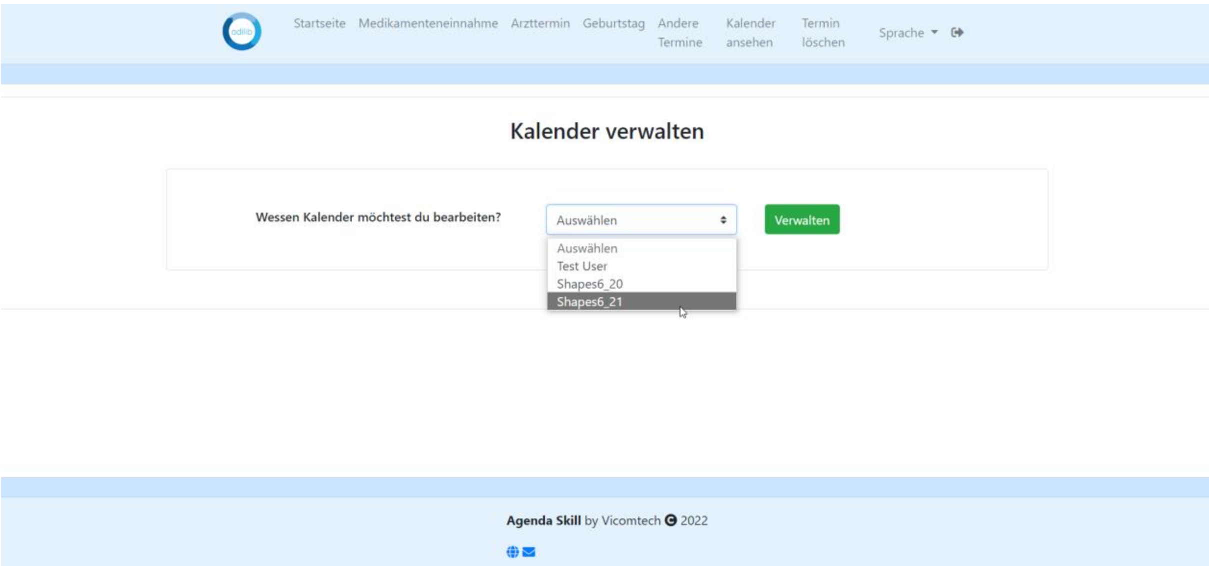

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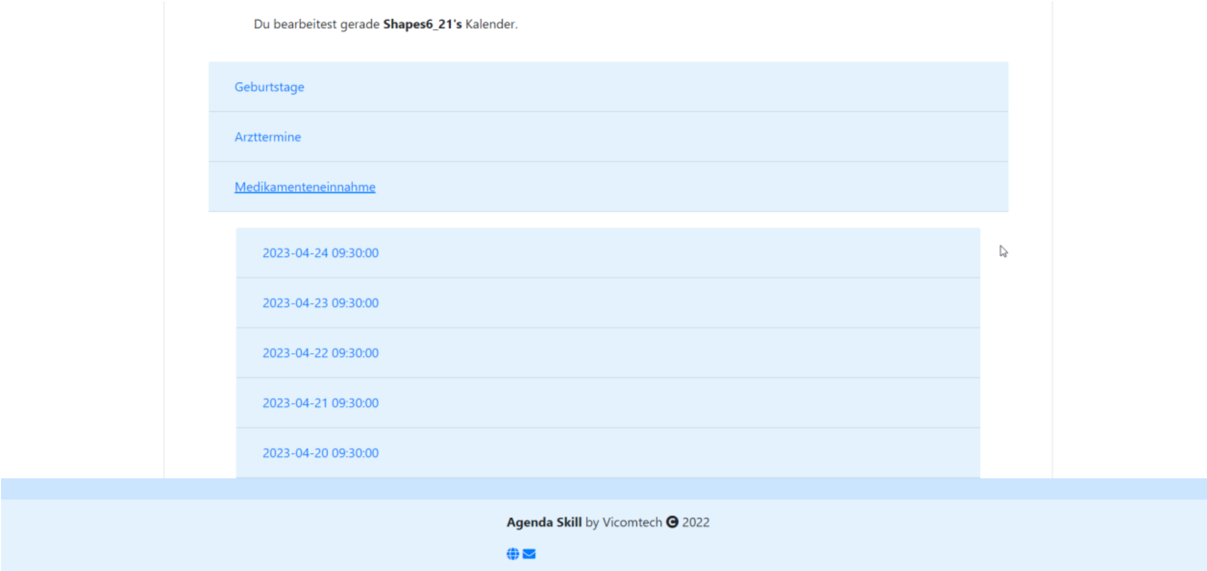
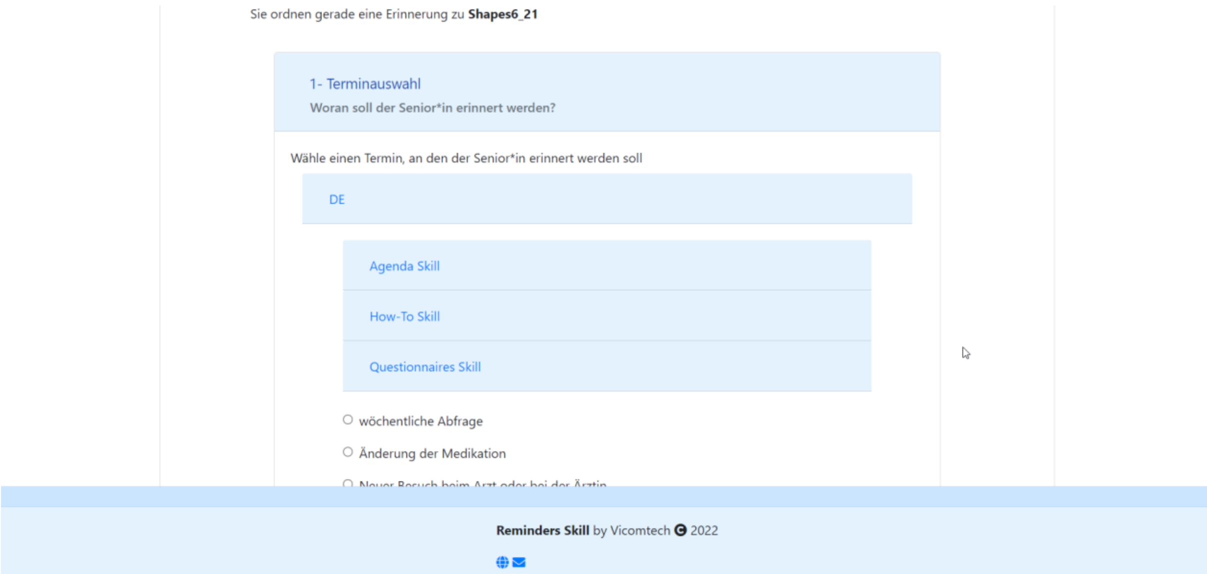


Create questionnaires:



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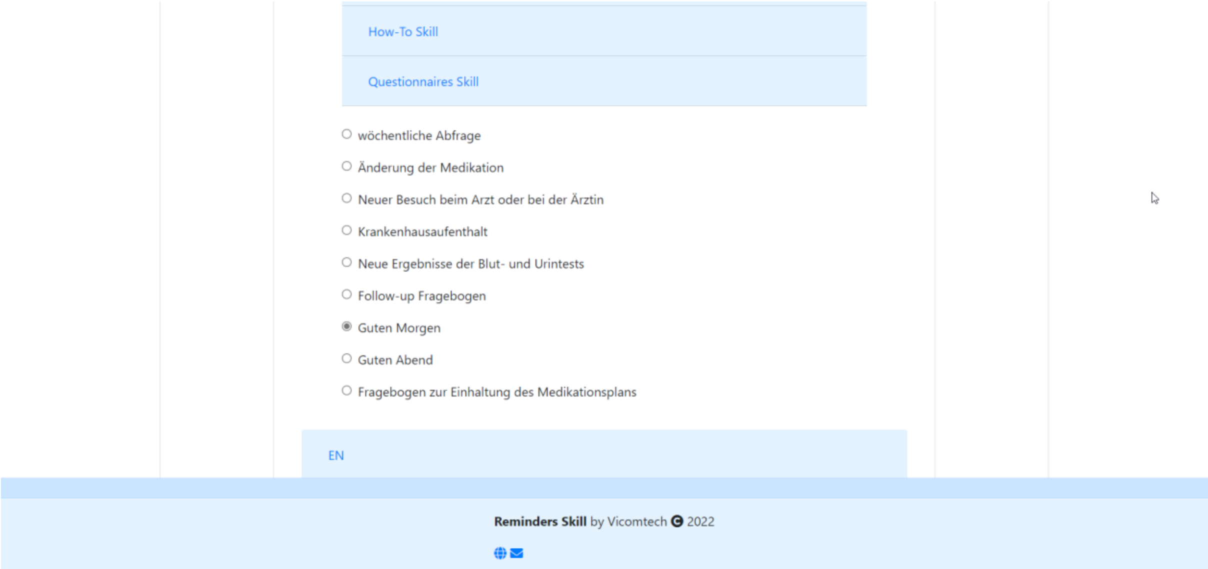

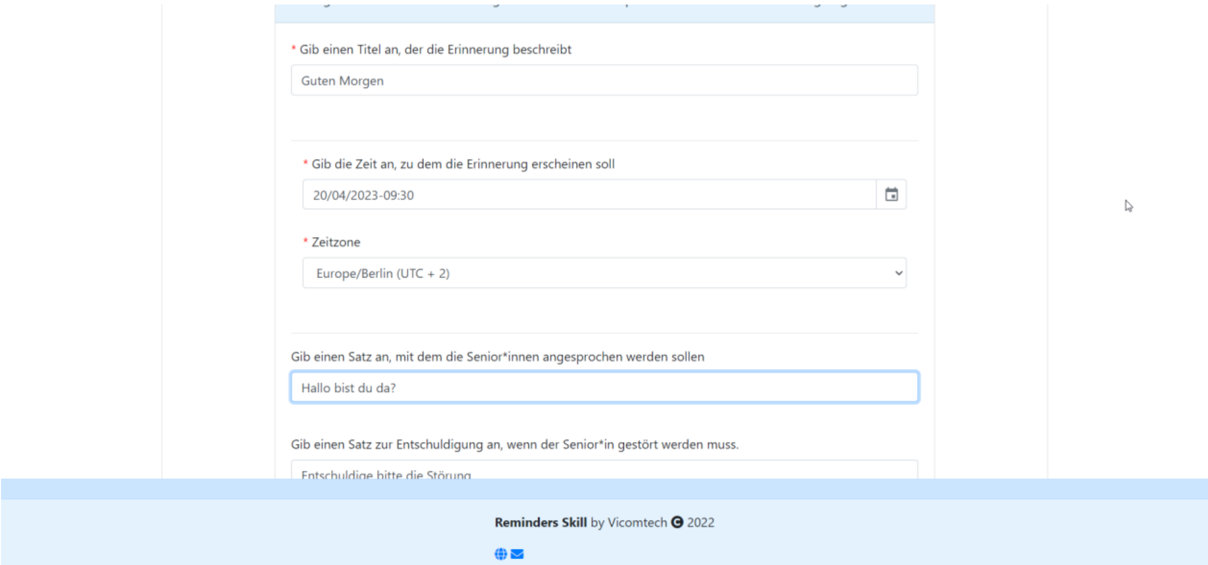

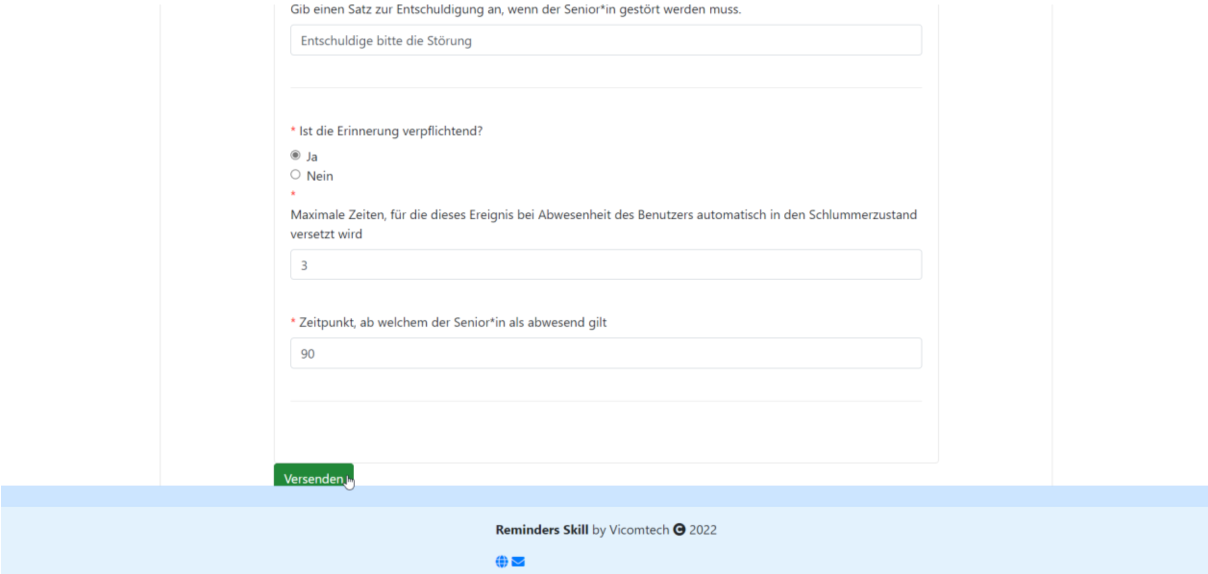

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Annex 29

UC-PT1-002 Test Dates phase 5

USER	Participant1		worked? yes/no	notes
general agenda overview				
birthdays				
Erna	24.04.2023		yes	
doctor appointments				
Blutabnahme	24.04.2023	11:00	yes	
Belastungs-EKG	24.04.2023	12:00	yes	
other appointments				
Friseurtermin	24.04.2023	12:30	yes	
Sportgruppe	24.04.2023	14:00	yes	
drug intake				
Gute Laune	24.04.2023	09:30	yes	
drug intake				
reminders				did only work, when assistant is opened in browser
birthdays	24.04.2023	09:30	yes	reminder worked (9:30), reminder comes as a voice message, reply only by text
***doctor appointments* (Blutabnahme)**	24.04.2023	10:00	yes	reminder worked (10:00), reminder comes as a voice message, reply only by text

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***doctor appointments* (Belastungs-EKG)**	24.04.2023	11:00	yes	reminder worked (10:00), reminder comes as a voice message, reply only by text
***other appointments* (Friseurtermin)**	24.04.2023	11:30	yes	reminder worked (10:00), reminder comes as a voice message, reply only by text
***other appointments* (Sportgruppe)**	24.04.2023	11:30	yes	reminder worked (10:00), reminder comes as a voice message, reply only by text
drug intake				
Gute Laune	24.04.2023	08:30	yes	reminder worked (9:38), reminder comes as a voice message, reply only by text
questionnaire				
Fragebogen Morgen	24.04.2023	09:30	yes	questionnaire worked (9:30); wellbeing and breakfast; questionnaires by voice, reply only by text
general feedback:	Voice control does not work, communication only by text			
	the digital assistant does not understand what the participant say			

USER	Participant2		worked? yes/no	notes
general agenda overview				
birthdays				
Max	20.04.2023		yes	
doctor appointments				
Blutabnahme	20.04.2023	11:00	yes	

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Belastungs-EKG	20.04.2023	12:00	yes	
other appointments				
Friseurtermin	20.04.2023	12:30	yes	
Sportgruppe	20.04.2023	14:00	yes	
drug intake				
Gute Laune	20.04.2023	09:30	yes	
reminders				did only work, when assistant is opened in browser
birthdays	20.04.2023	09:30	yes	reminder worked (9:30), reminder comes as a voice message, reply only by text
***doctor appointments* (Blutabnahme)**	24.03.2023	10:00	yes	reminder worked (10:00), reminder comes as a voice message, reply only by text
***doctor appointments* (Belastungs-EKG)**	24.03.2023	11:00	yes	reminder worked (10:00), reminder comes as a voice message, reply only by text
***other appointments* (Friseurtermin)**	24.03.2023	11:30	yes	reminder worked (10:00), reminder comes as a voice message, reply only by text
***other appointments* (Sportgruppe)**	24.03.2023	11:30	yes	reminder worked (10:00), reminder comes as a voice message, reply only by text
drug intake				
Gute Laune	24.03.2023	08:30	yes; but too late	reminder worked (9:38), reminder comes as a voice message, reply only by text
questionnaire				
Fragebogen Morgen	24.03.2023	09:30	yes	questionnaire worked (9:30); wellbeing and breakfast; questionnaires by voice, reply only by text

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general feedback:	communication by speech is not possible			
	the digital assistant does not understand what the participant say			
	communication is only possible by text			

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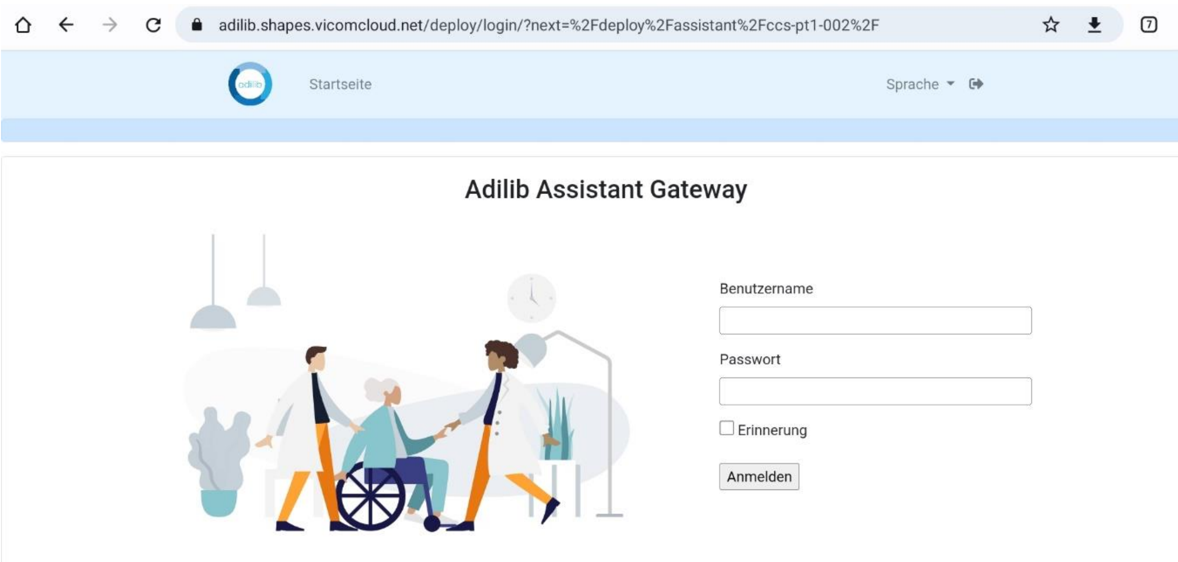
Annex 30

UC-PT1-002 Test protocol phase 5

SHAPES PT 1 – UC002

Phase 5

20.04.2023 documentation about the communication between Digital Assistant and participant:



The Digital Assistant is browser based. The user/participant need the link and has to login with the username and the password by every use.

Saying "Hey Nari" by the participant does work – the Digital Assistant give a sound to indicate that the system understand it and to indicate that the Digital Assistant is ready.

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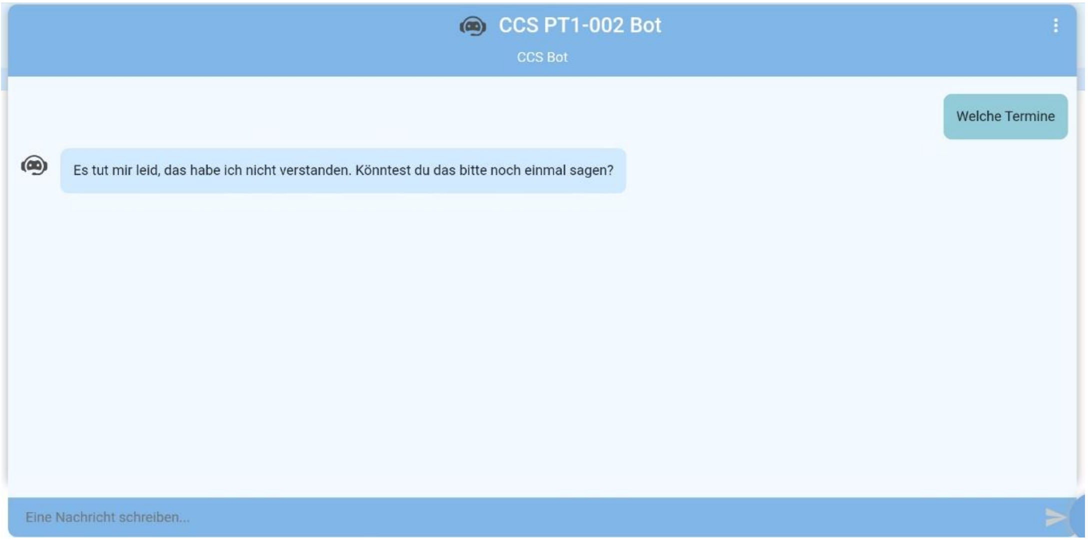

But then the Digital Assistant does not understand the participant by speech.

The Digital Assistant does not understand the participant by speech.

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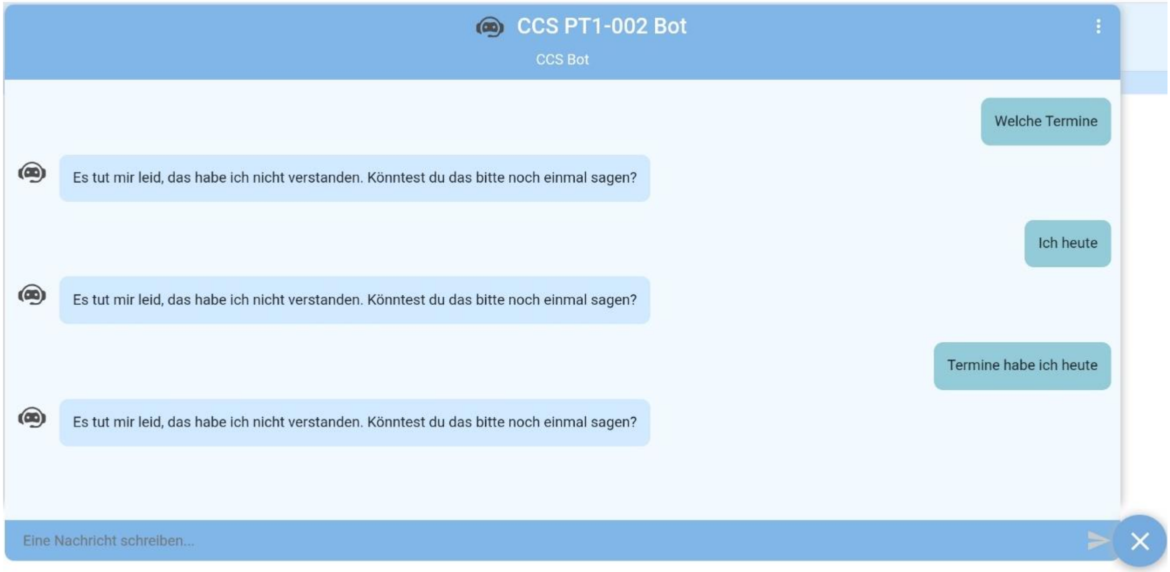
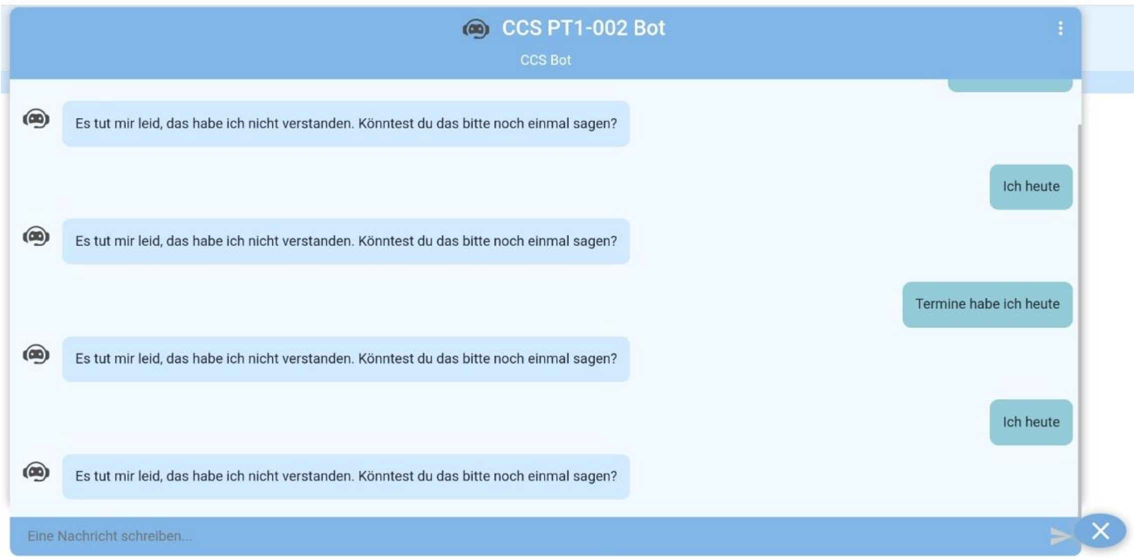


The Digital Assistant does not understand the participant by speech.



The Digital Assistant does not understand the participant by speech.

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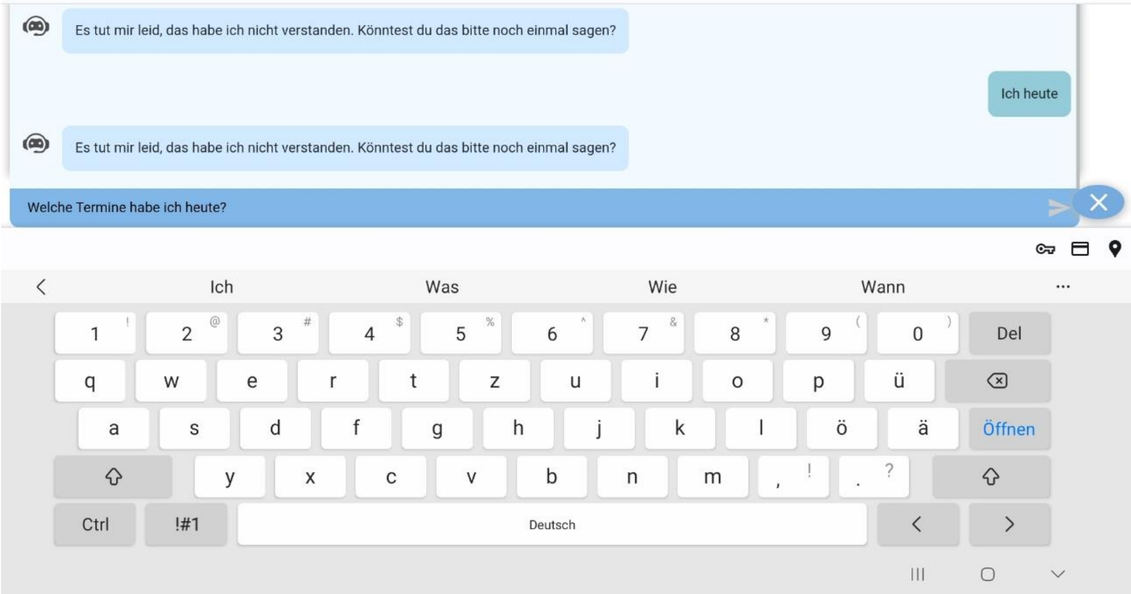
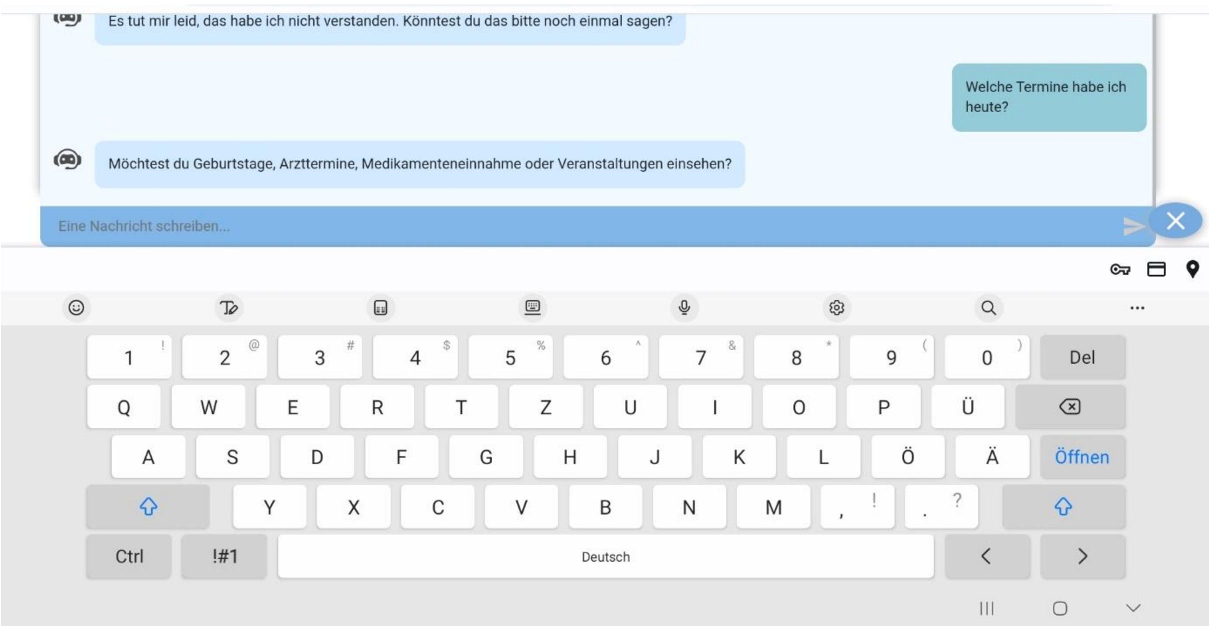


Communication with the Digital Assistant is only possible by text for the participant.



The Digital Assistant does understand the question only by text and give the right answer.

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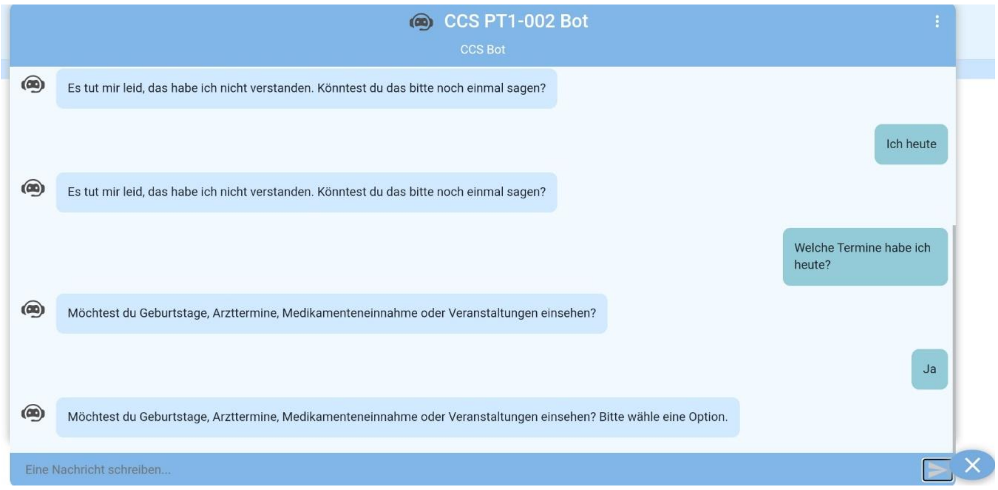

Communication by text is working.

Communication by text is working.

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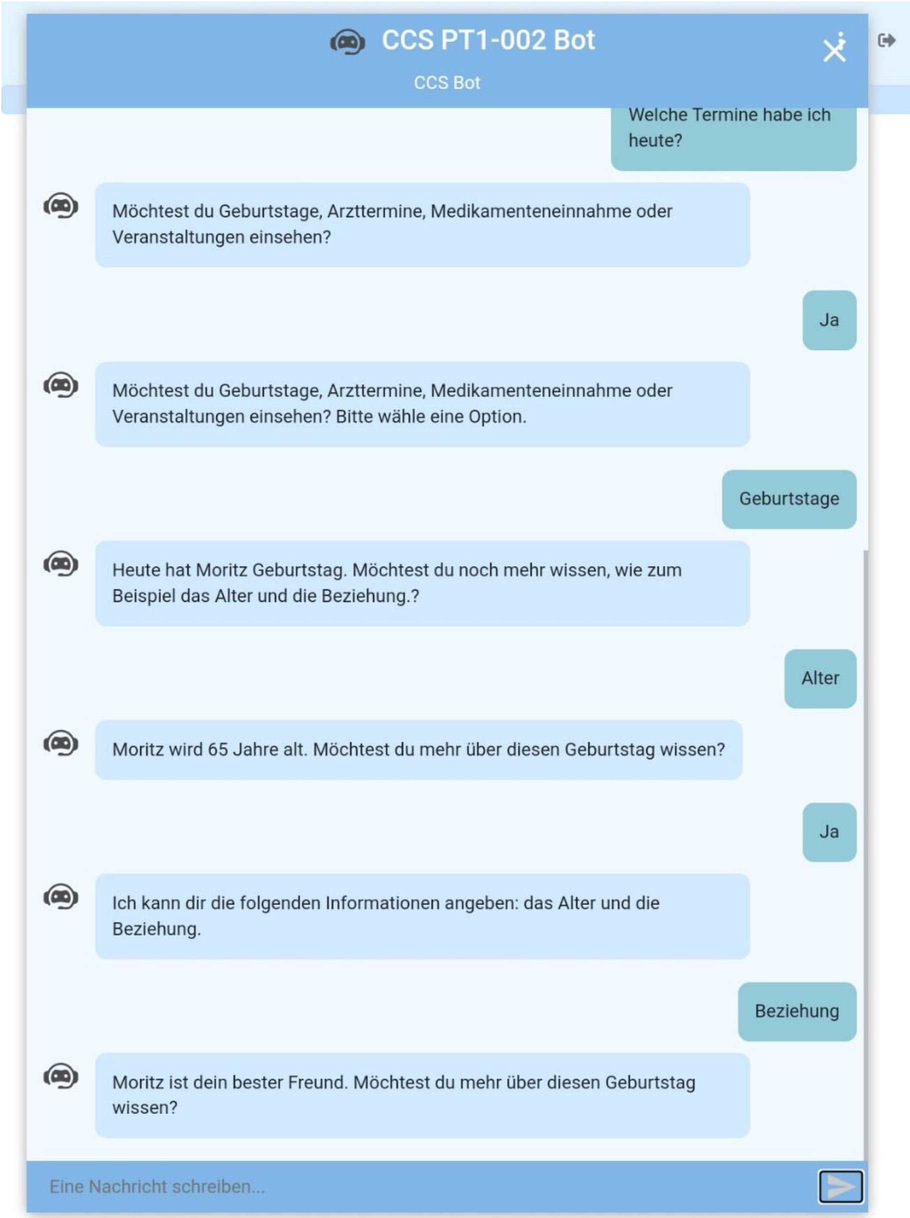

Communication by text is working.

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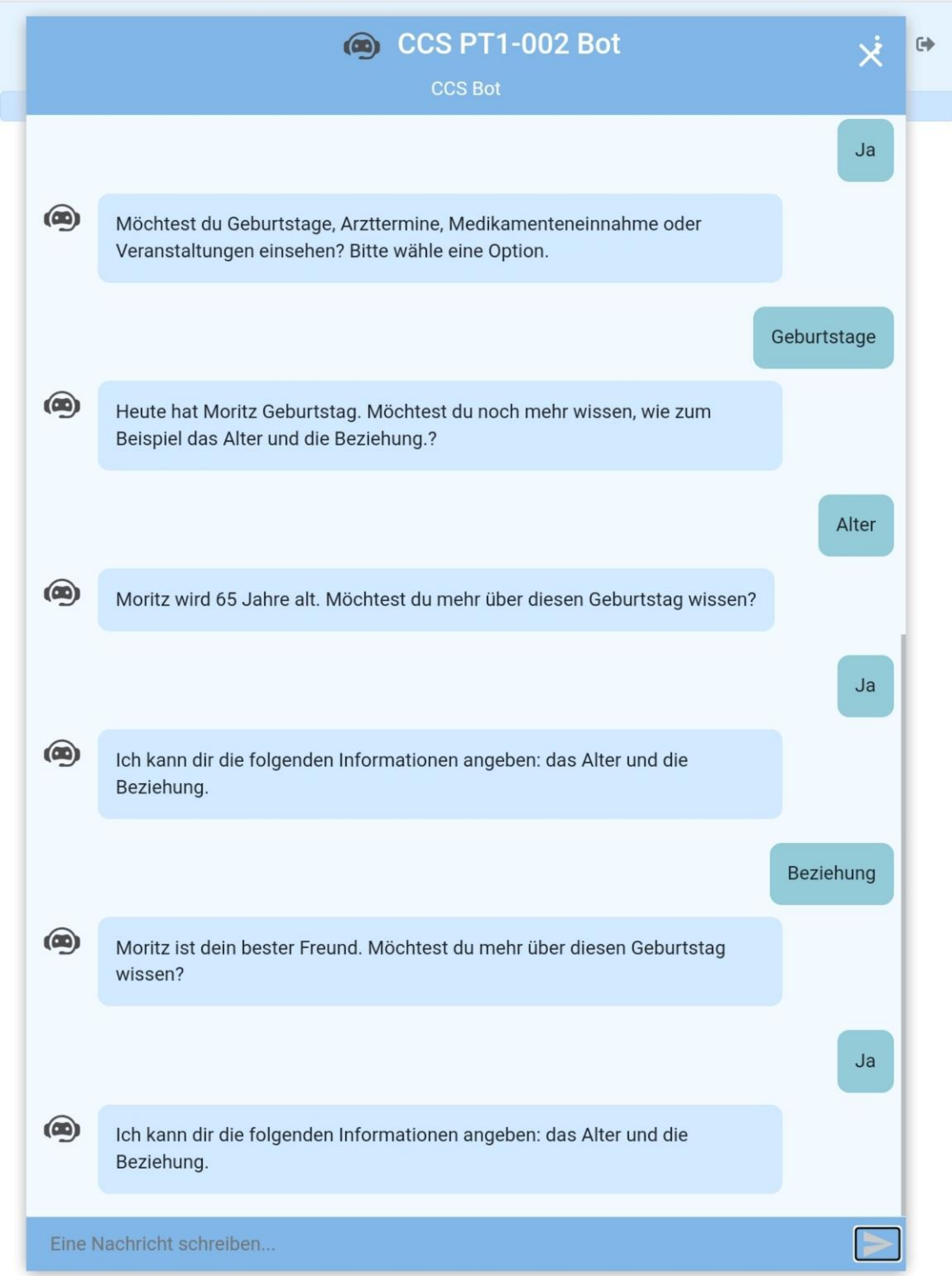

The Digital Assistant does not recognise that all available information about the event has already been given – the query is repeated over and over again.

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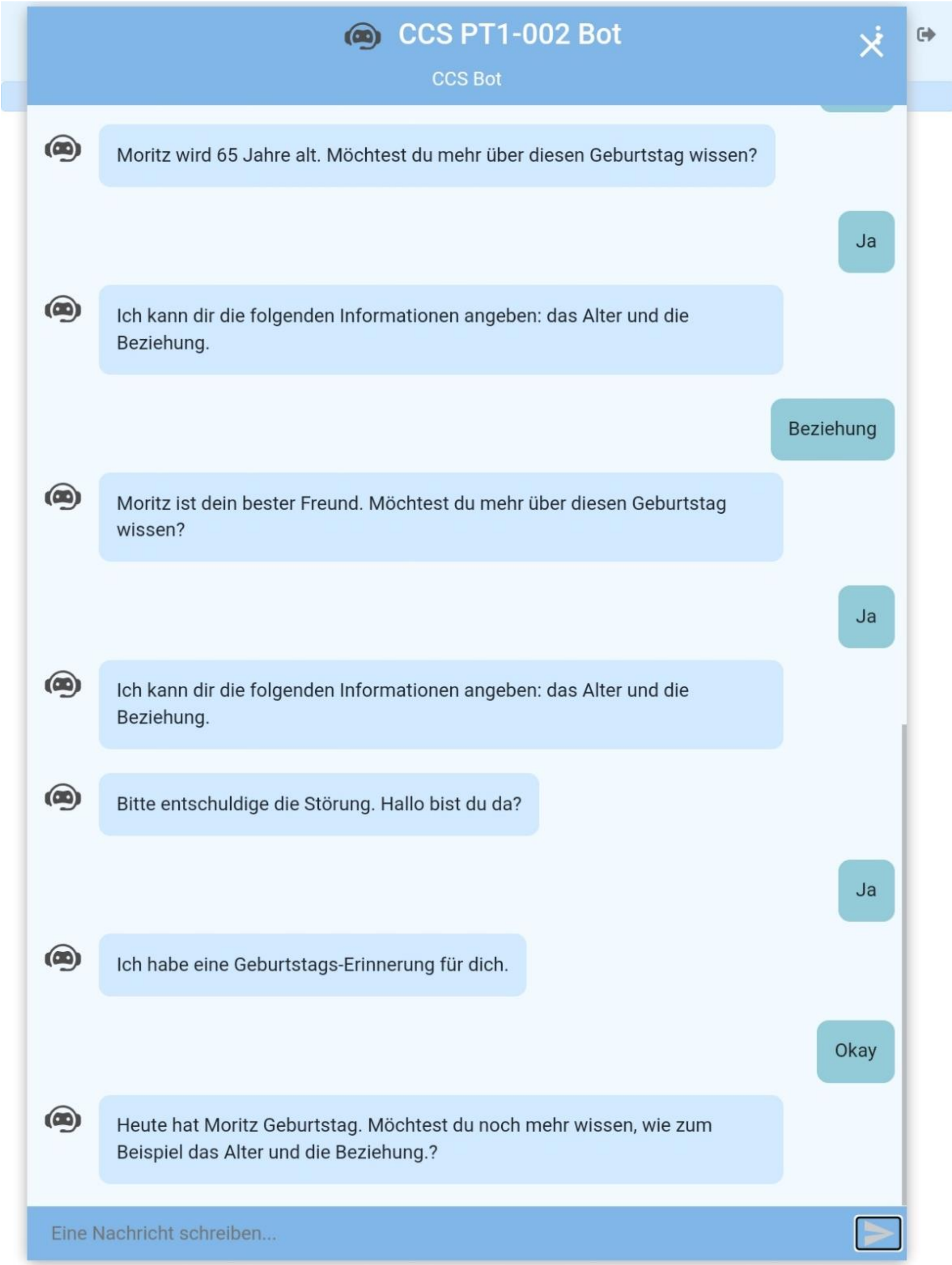

The Digital Assistant has given the reminder for the Birthday.

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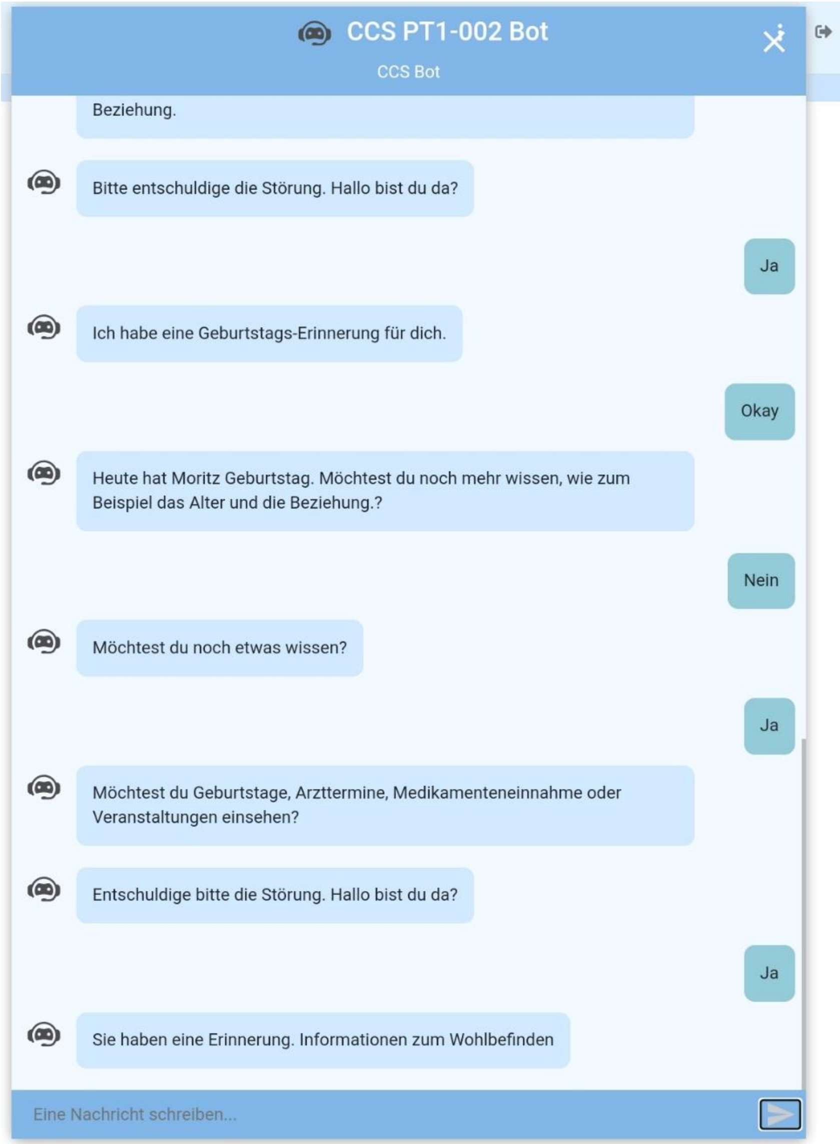

The Digital Assistant has given the reminder for the wellbeing questionnaire.

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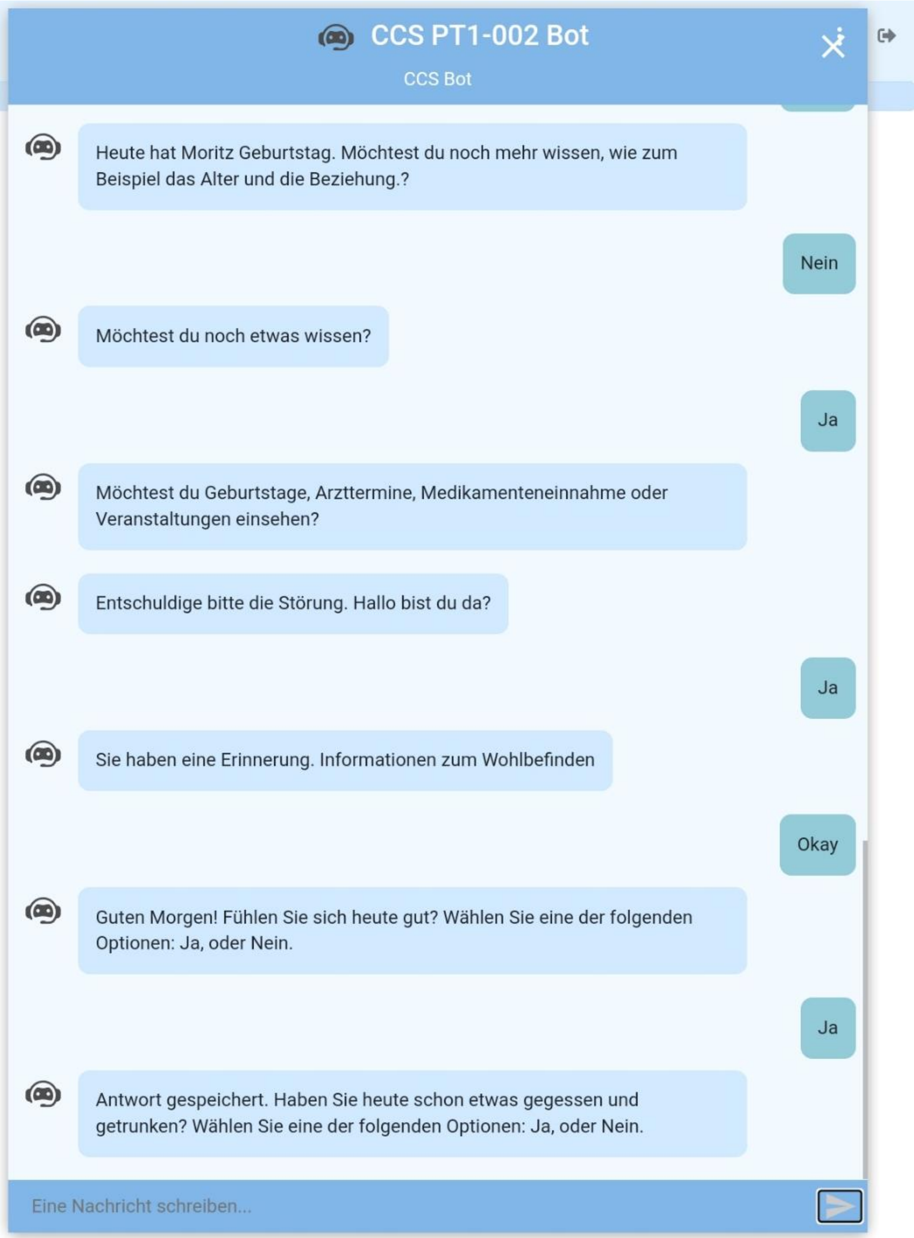

The Digital Assistant ask the participant about „How do you feel today?“ and “What about eating and drinking”.

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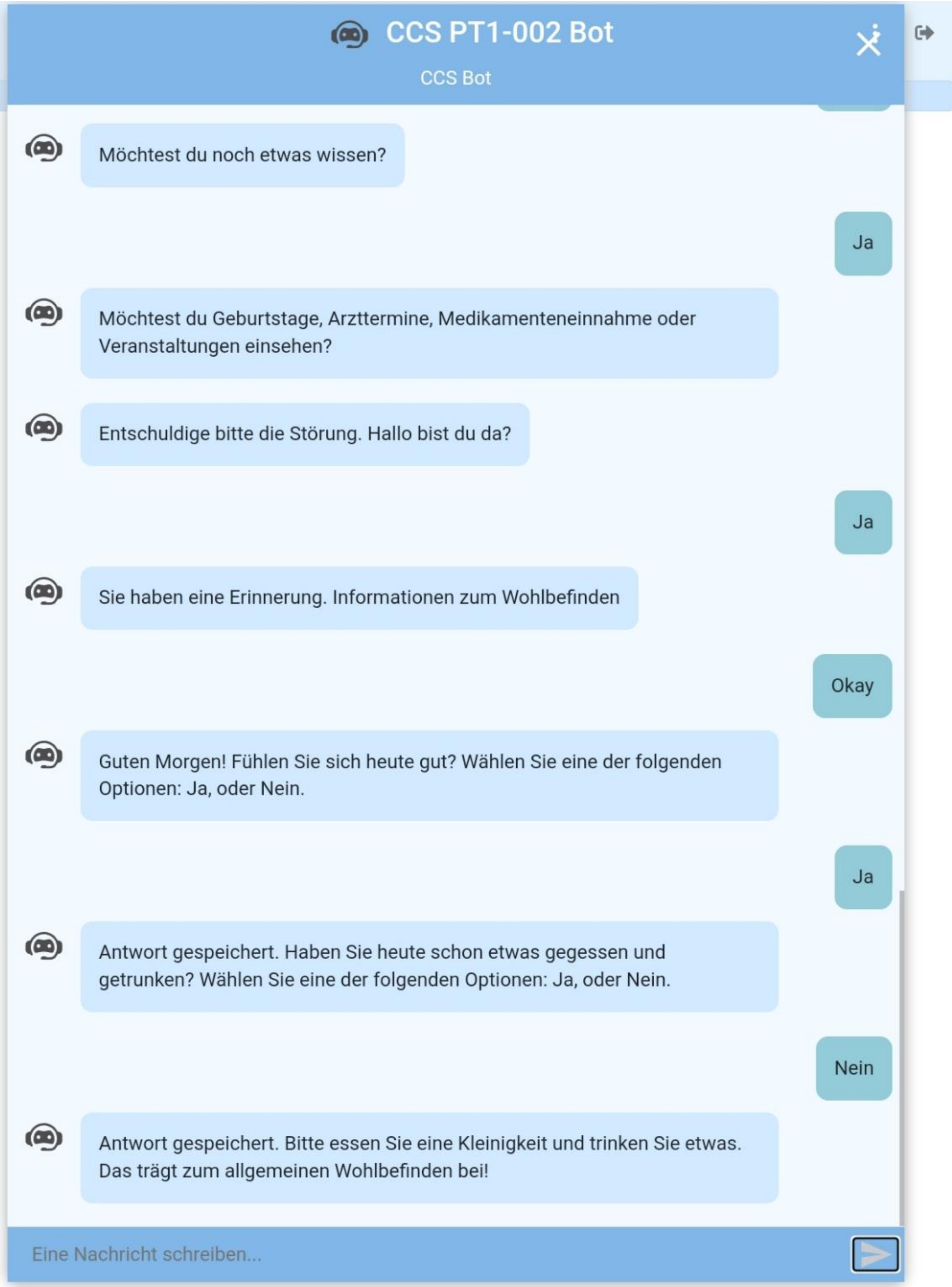

The participant can only answer by text.

The Digital Assistant give the participant the information that it would be better if the participant eat something.

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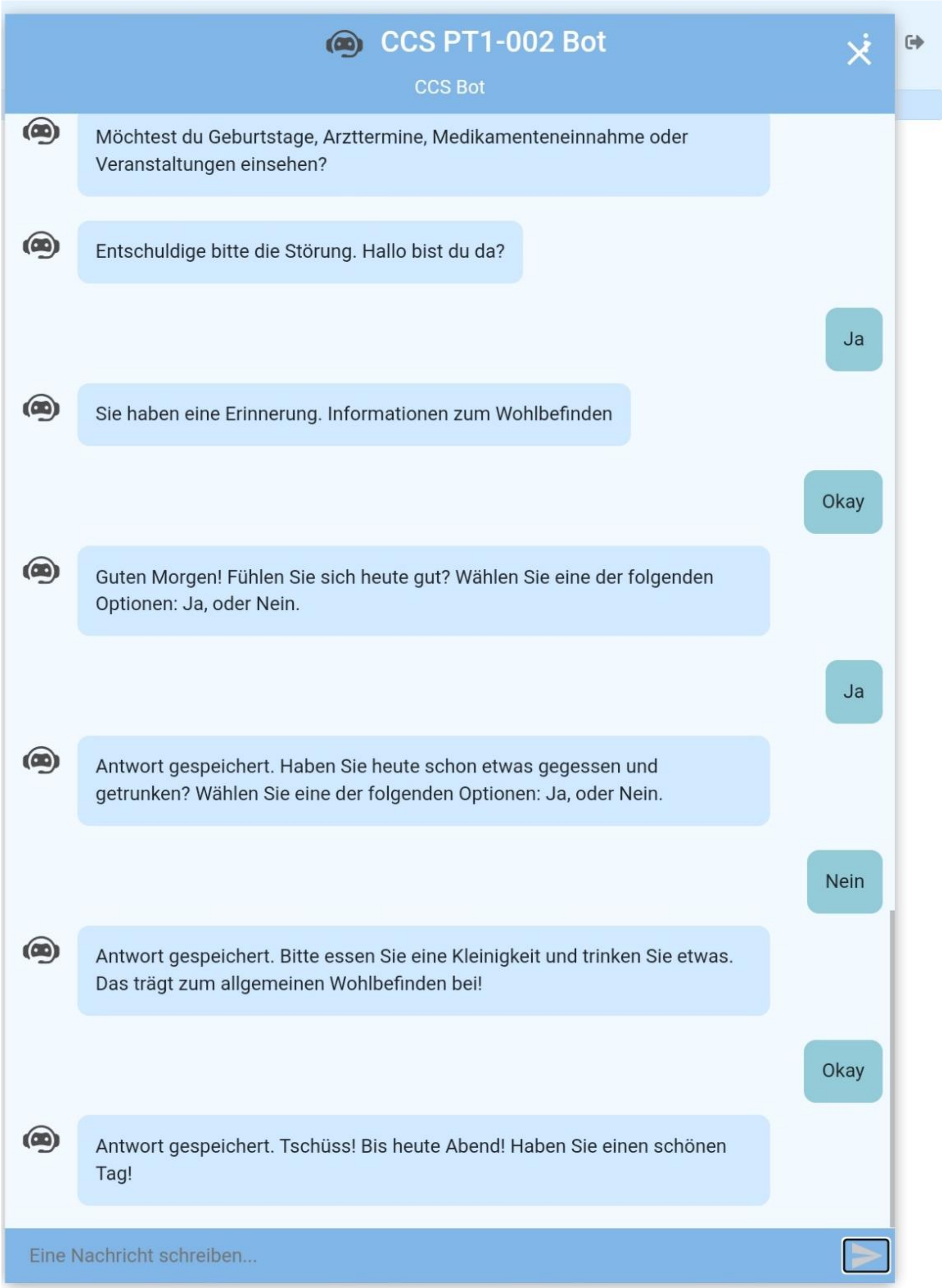

The participant can only communicate by text with the digital assistant. The participant give the answer “okay”. The Digital Assistant does not enquire further information.

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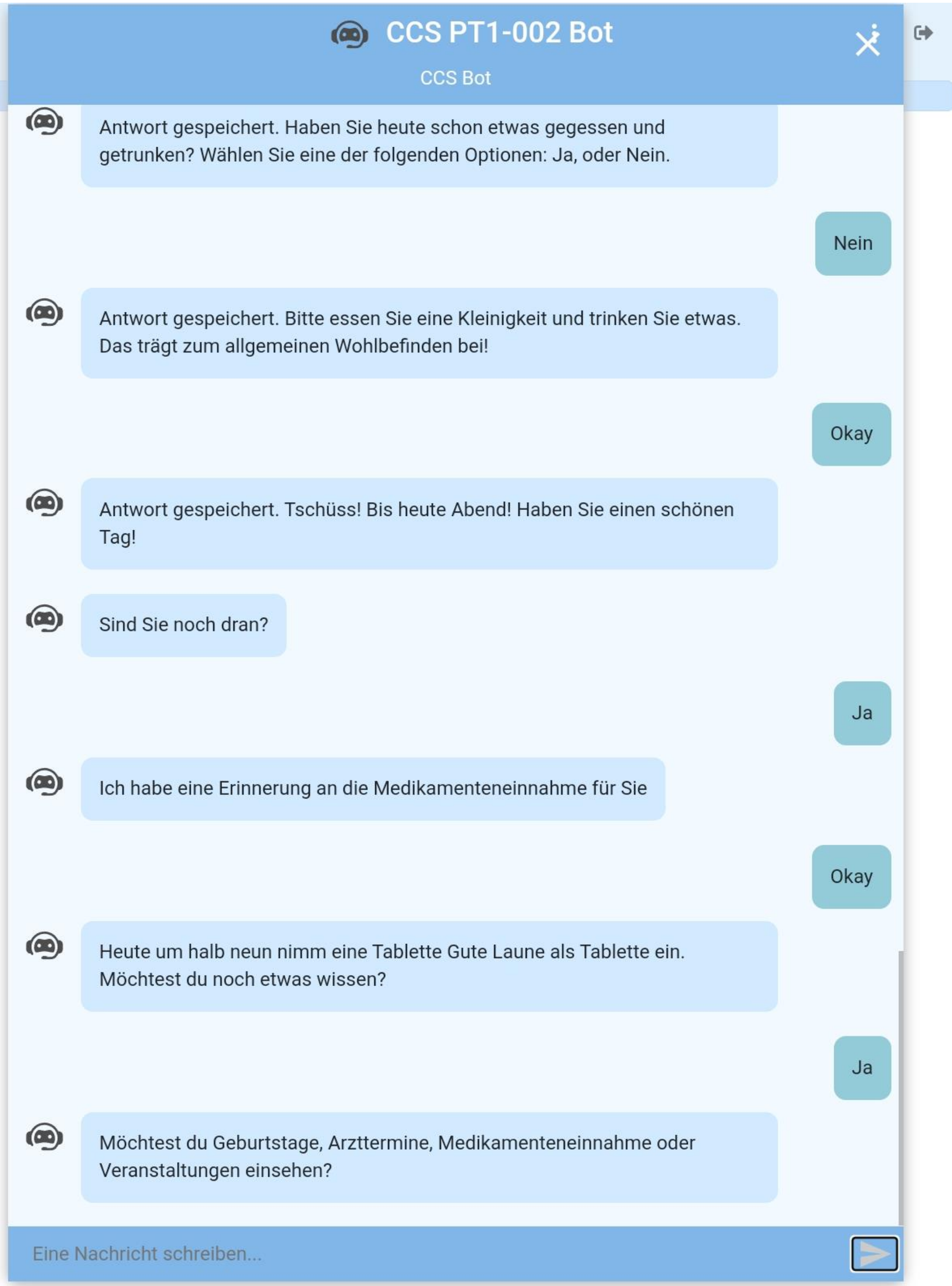

The Digital Assistant reminds the participant on medication intake.

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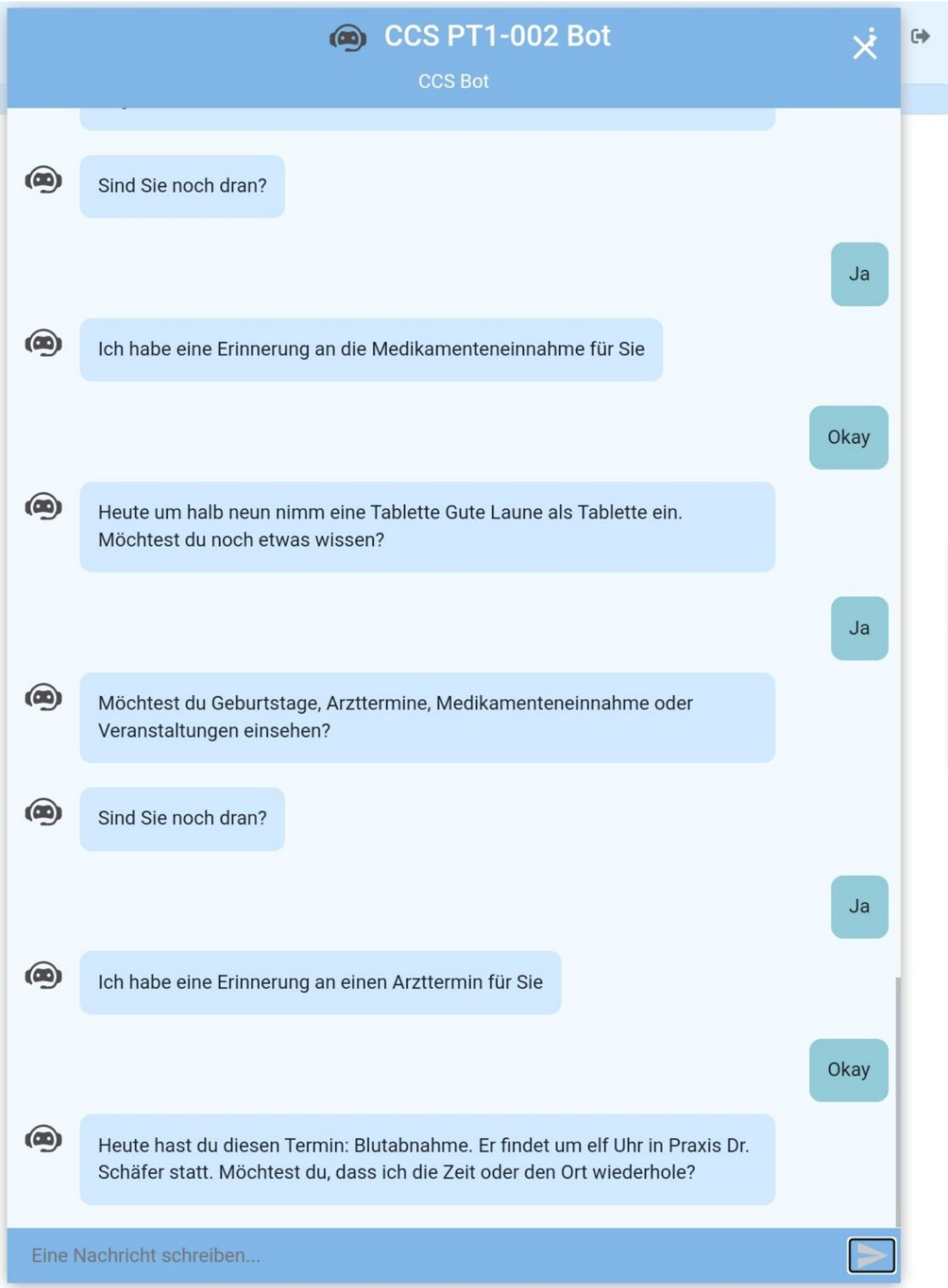
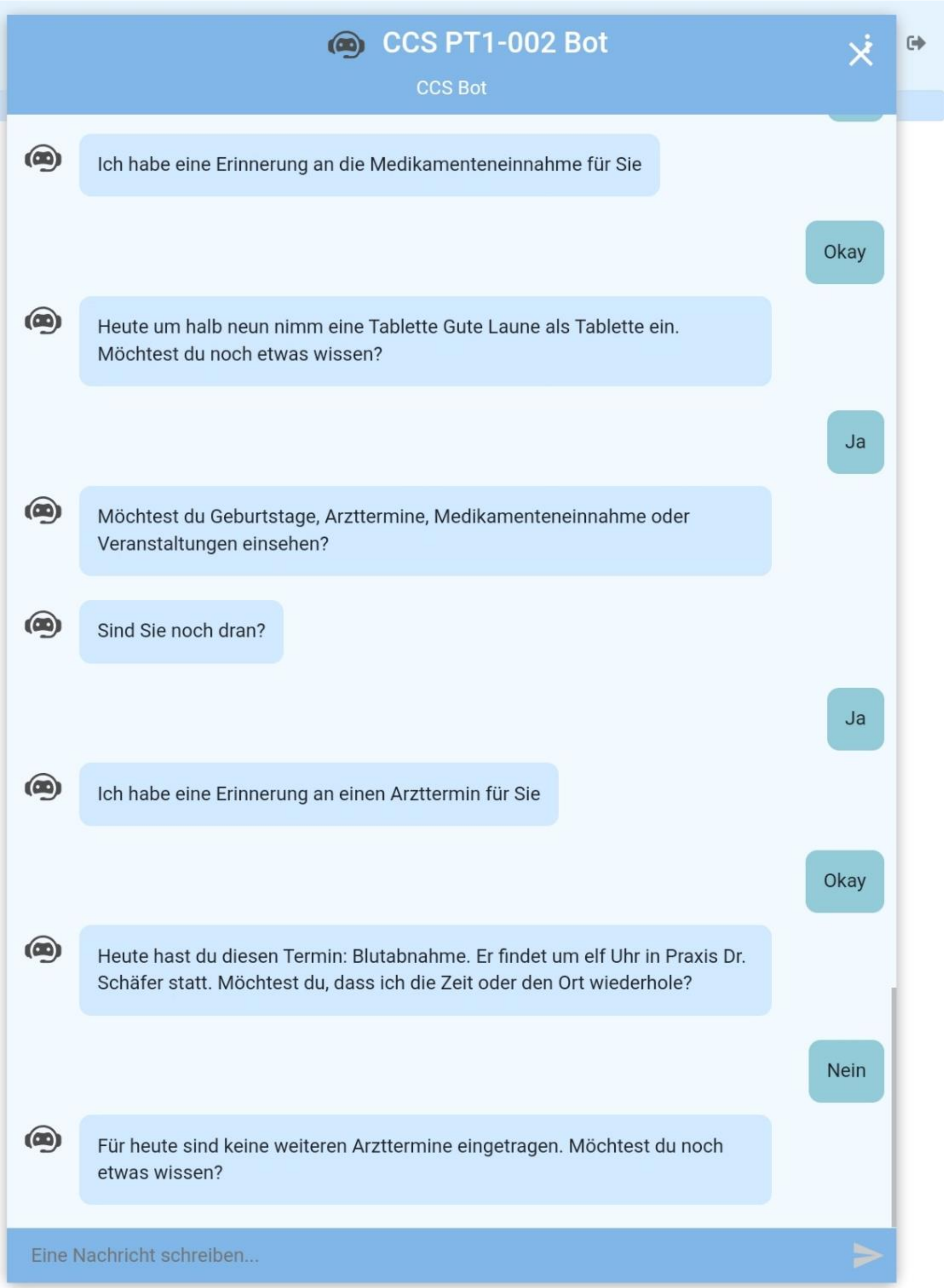


The Digital Assistant reminds the participant on doctor appointment.



End of the communication, no new reminders for the day.

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Annex 31

UC-PT1-002 SUS Score KPI 6

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_31_UC-PT1-002_KPI-6-SUS-Score.xlsx

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Annex 32

UC-PT1-002 Harmonised Data

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_32_UC-PT1-002_Harmonised-Psychosocial-Data.xlsx

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Annex 33

UC-PT1-002 Evaluation final questionnaires

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_33_PT1-UC002_Evaluation-final-questionnaires.xlsx

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Annex 34

UC-PT1-003 Data Plan

Outcome	Domain	Type of variable	Frequency of assessment
General data (i.e. data related with all pilot goals/covariates)			
Caregiver data			
Caregiver age	Socio-demographic	Discrete	Baseline (T0)
Caregiver highest educational degree	Socio-demographic	Nominal	Baseline (T0)
Caregiver spatial distance to care receive**r**	Socio-demographic	Continuous	Baseline (T0)
Internet-related variables with regard to care receive**r**			
Access to device with internet connection at least twice a week (inclusion criteria; Yes/No)	ICT use characterization	Dichotomous	Baseline (T0)
Skilled to use internet (inclusion criteria assessed by referral of participants; Yes/No)	ICT use characterization	Dichotomous	Baseline (T0)
Frequency of internet use	ICT use characterization	Discrete	Baseline (T0)
Caregiving-related data			
Type of care provided (Formal vs. informal)	caregiving characterization	Nominal	Baseline (T0)
Duration of care provision (in years)	caregiving characterization	Continuous	Baseline (T0)
Frequency of care provision (number of hours per week)	caregiving characterization	Discrete	Baseline (T0) / Continuous data collection (at half and end of phase)
Existence of other care providers (Yes/No)	caregiving characterization	Dichotomous	Baseline (T0) / Continuous data

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			collection (at half and end of phase)
Relationship with the care receiver	caregiving characterization	Nominal	Baseline (T0)
Cohabitation with the care receiver (Yes/No)	caregiving characterization	Dichotomous	Baseline (T0) / Continuous data collection (at half and end of phase)
Care receiver data			
Care receiver age	Socio-demographic	Discrete	Baseline (T0)
Care receiver gender	Socio-demographic	Nominal	Baseline (T0)
Degree of dependence (subjectively evaluated by the informal caregiver)	Disease characterization	Nominal	Baseline (T0) / Continuous data collection (every third of the phase)
Individual top three challenges	Socio-demographic	Nominal	Baseline (T0)
Use Case 3 (Overcome Digi Fear)			
Number of use of video-call-solution	Acceptance	Discrete	Continuous data collection (daily)
Time of use of video-call-solution	User Confidence	Continuous	Continuous data collection (daily)
Momentary state of satisfaction with (technical/practical) interaction (not with content)	User Satisfaction	Nominal	Continuous data collection (after each use)

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Annex 35

UC-PT1-003 MOMENTUM

7 List of indicators

For ease of use, this section contains a complete list of the 51 indicators already presented sequentially in Sections 3-6 in the context of each individual critical success factor.

7.1 Context

7.1.1 CSF 1. Ensure that there is cultural readiness for the telemedicine service

- In my organisation/region doctors and other healthcare professionals are ready to share clinical information with each other and with the patient i.e., there is a level of trust among all the stakeholders.

YES. According to interviews in mock-ups, participants of the pilot conducted by CCS are willing to share activity data with them.

- In my organisation/region user and providers (healthcare professionals) are ready to use ICT (e.g., computers, tablets, mobile phones).

YES. Care providers at health region Saxony already use ICT in their daily work. Patients usually accepts new technologies as far as they have a clear benefit.

- In my organisation/region financial and other incentives are aligned with the service to be deployed.

TO DO. Financial strategy has to be developed.

- In my organisation/region an underpinning culture embraces technology.

YES. CCS is aware of the importance of incorporating cost-effective digital solutions. CCS regularly supports and leads projects to develop digital solutions for seniors and improve care.

- In my organisation/region an underpinning culture welcomes and even promotes change, innovation and shows openness to new ideas.

YES. CCS is a partner in several projects that promote the development of digital technologies in healthcare. CCS is in regular contact with relevant networks.

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7.1.2 CSF 2. Come to a consensus on the advantages of telemedicine in meeting compelling need(s)

- In my region/organisation there is general consensus on the current telemedicine solution being the best available solution for meeting a compelling need.

YES. The core business of CCS is the management and coordination of sustainable approaches to securing and improving healthcare, including video consultations or a digital therapy companion. The SHAPES App itself and the developed video call solution are seen as a great tool to assist the user in daily activities and let them stay socially connected.

- The current telemedicine solution is the best available solution for meeting a compelling need.

NOT SURE. The digital assistant as support in daily tasks and for alleviating isolation is still a research area, where more data is needed to optimise the type of interaction required for such goals.

7.2 People

7.2.1 CSF 3. Ensure leadership through a champion

- In my region/organisation there is one or several influential person(s) who take(s) on a leading role and leads the way towards deployment of the telemedicine solution tested in our project.

YES. CCS and MedicalSyn has developed a video consultation solution, which is used in several clinics of the University Hospital in Dresden.

7.2.2 CSF 4. Involve healthcare professionals and decision-makers

- Healthcare professionals have been involved in the development of the content of this project.

NO. The deployment of this use case did not foresee any participation of health care professionals and thus they have not been involved in the development.

- Healthcare professionals have been involved in the development of the process and time schedule for this project.

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NO. The deployment of this use case did not foresee any participation of health care professionals and thus they have not been involved in the development.

- Decision-makers have been involved in the development of the content of this project.

YES. Dr. Olaf Müller (former CEO of CCS) and Johannes Klaus (CEO of CCS) have been involved in the development of the content of this project, of the process and time schedule for this project.

- Decision-makers have been involved in the development of the process and time schedule for this project.

YES. Dr. Olaf Müller (former CEO of CCS) and Johannes Klaus (CEO of CCS) have been involved in the development of the content of this project, of the process and time schedule for this project.

7.2.3 CSF 5. Put the patient at the centre of the service

- In this project[17] the patients have been sufficiently involved in the development of the telemedicine solution.

YES. Older people representative of final users have been involved in mock-up presentations in phase 2, hands-on training sessions in phase 3 and piloting activities in phase 5.

- In this project telemedicine service is based on the patient´s needs.

YES. Objectives is to promote social activity and active healthy ageing. Studies show that seniors who stay socially active and engaged experience a variety of benefits, both in physical and psychological health.

- In this project enough information and training is provided for the patients in order for them to obtain the best results possible from using the telemedicine solution.

YES. Training will be included in the design of phase 3, 4 and 5.

7.2.4 CSF 6. Ensure that the technology is user-friendly

- The telemedicine technology used in our project is user-friendly for patients.

TO DO. It is the objective and great effort is done within the SHAPES consortium to define requirements to fulfil this.

- The telemedicine technology used in our project is user-friendly for health professionals.

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NO. User experienced is centred on the care receiver and care giver.

- The telemedicine technology used in our project does not need an extended training process prior to using it.

YES. Half-day training is expected to be sufficient.

7.3 Plan

7.3.1 CSF 7. Pull together the resources needed for deployment

- In my region/organisation the financial resources needed for deployment of the telemedicine solution are available.

YES. SHAPES and already allocated internal resources are provided (for pilot).

- In my region/organisation the IT competences needed for deployment of the telemedicine solution are available.

YES. CCS staff is able to provide IT competences.

- In my region/organisation enough time for the training needed in order to implement the telemedicine solution is available.

YES. It is included in the SHAPES agreement.

7.3.2 CSF 8. Address the needs of the primary client(s)

- The telemedicine solution addresses the needs of the primary clients.

YES.

Older people living alone at home are the clients. The digital assistant provides support in daily activities, securing an autonomous life at home.

- The telemedicine solution is sufficiently adapted to the needs of the primary users.

YES. Needs were defined based on interviews with older people and caregivers.

- The telemedicine solution addresses the needs of the health sector.

NO: The primary objective of video call solution to support older people at home. It does not take medical issues into account.

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- The telemedicine service addresses the needs for efficiency improvement and improvement of quality in the health sector.

NO. The digital assistant could increase the quality of life the seniors but is not affecting the efficiency or quality in the health care sector directly.

- The telemedicine service is adapted to the need for cooperation between municipalities.

NO.

- The telemedicine service is adapted to the need of the health sector for interaction in with the principle of Best Efficient Level of Care.

NO.

[17] The wording of these indicators tends to focus on use of the word project. However, in many telemedicine settings, words such as service or initiative or venture might prove to be more suitable. Alternatively, organisation or region might also be considered.

7.3.3 CSF 9. Prepare and implement a business plan

- A business plan for the project has been developed.

To do (D7.3 SHAPES Business Plan WP7)

- A business plan for the project has been implemented.

To do after the pilot.

- The business plan has been approved by the relevant management level.

To do after the pilot

7.3.4 CSF 10. Prepare and implement a change management plan

- A change management plan for the project has been developed.

To do after the pilot.

- A change management plan for the project has been implemented.

To do after the pilot.

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- A change management plan has been approved by the relevant management level.

To do after the pilot.

7.3.5 CSF 11. Assess the conditions under which the service is legal

- Prior to the start of the project, we assessed the conditions under which the service is legal.

YES. Completing a Data Protection Impact Assessment (DPIA) identified and minimized any risks associated with the pilot with input sought from other WP and the SHAPES Data Protection Officer at CCS. Data processing agreements will be established with relevant partners to permit access to pseudonymized data.

7.3.6 CSF 12. Guarantee that the technology has the potential for scale-up

- We are fully aware of what it takes for the technology to be deployed on a large scale.

To do after pilot. Scaling up of the digital assistant manufacturing is a complex process and needs to be evaluated along with the cost-efficiency analysis.

- In our region/organisation we are ready for large-scale deployment of the technology.

YES. CCS is working together with several facilities providing education for older seniors who are willing and interested to use digital solutions in their daily life.

- The project will supply the documentation needed to ensure that there is a basis for large-scale deployment of the project.

To do after the pilot.

7.4 Run

7.4.1 CSF 13. Identify and apply relevant legal and security guidelines

- The project is carried out in accordance with the relevant guidelines on legal matters.

YES. CCS was in contact with several DPOs.

- The project is carried out in accordance with the relevant guidelines on security matters.

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YES. GDPR will be applied. The system provided implements all security and privacy related regulations.

7.4.2 CSF 14. Involve legal and security experts

- We have received advice on the project from legal experts.

YES. We worked with LAUREA, with extensive expertise in this field and with VICOMTECH, who was awarded with the ISO 27001 certification for information security management.

- We have received advice on the project from experts on data security matters.

YES. CCS worked with SHAPES partners to implement a data management plan.

- In this project we are not experiencing any data security problems.

NO. However a risk assessment regarding data management will be developed and updated to foresee any potential data security problems.

- I have confidence in the legality of this project.

YES. It's a H2020 project with partners with extensive expertise in this field (LAUREA for example).

- I have confidence in the security of this project.

YES. It's a H2020 project with partners with extensive expertise in this field (HMU and PAL for example).

7.4.3 CSF 15. Ensure that telemedicine doers and users are privacy aware

- In this project the telemedicine doers are aware of protecting the patients´ privacy in terms of health information and other information collected during the course of the pilot.

YES. CCS works with data protection protocols. They will be also instructed the application of data protection with the new technologies introduced in the pilot. Older people and informal caregivers will be informed about data collection and process and consents will be collected.

7.4.4 CSF 16. Ensure that the information technology infrastructure and eHealth infrastructure are available

- We have ensured that the IT infrastructures needed are in place for deployment and large-scale implementation.

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YES. Large-scale implementation will be evaluated after the pilot.

- We have ensured that the eHealth infrastructures needed are in place for deployment and large-scale implementation.

NOT SURE. All parts of the infrastructure are provided by SHAPES partners.

7.4.5 CSF 17. Put in place the technology and processes needed to monitor the service

- We have set up a system to monitor our telemedicine service ensure that it is running smoothly at all times.

YES. In case of any bugs or issues the development team from the involved tec partner will fix it.

- We have set up a system to solve any incident that may occur during the service.

NOT SURE. The users get a support hotline during the different phases with a responsible contact person.

- We have a system which supports the end-users in resolving any doubts that they might experience with the telemedicine solution.

YES. Apart from the user manual, CCS ensures a direct communication to the participants.

7.4.6 CSF 18. Establish and maintain good procurement processes

- We have clear agreements regarding the quality of the deliveries provided by our vendors.

All technologies in current version of the technology come from SHAPES partners.

- We have clear agreements regarding the service level provided by our vendors.

All technologies in current version of the technology come from SHAPES partners.

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Annex 36

UC-PT1-003 Evaluation of the questionnaires phase 2 (Mock-ups)

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_36_PT1_UC003_-Evaluation-questionnaires-Mock-up.xlsx

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Annex 37

UC-PT1-003 Evaluation of the questionnaires phase 3 (Hands-On sessions)

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_37_PT1_UC003-Evaluation-questionnaires-Hands-on.xlsx

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Annex 38

UC-PT1-003 User Manual

Leitfaden

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1. Vorwort

Liebe Projektteilnehmer,

wir freuen uns, dass Sie Teil unseres sächsischen Piloten im Projekt SHAPES sind und mit uns gemeinsam die Lösungen unserer technischen Partner aus Europa für eine intelligente Wohnumgebung testen möchten. Sie leisten damit einen wichtigen Beitrag zur europaweiten Gesundheitsforschung.

Sie haben uns schon über mehrere Phasen im SHAPES Projekt begleitet und sind von Anfang an in die Entwicklung der Geräte involviert. Dafür sind wir Ihnen sehr dankbar. Nun befinden wir uns in der letzten Phase, in der Testung der Prototypen.

Zielstellung der Testphase ist es, die Geräte auf Funktionsfähigkeit und Nutzerfreundlichkeit zu testen. Zudem möchten wir gern mehr von Ihnen zur Handhabbarkeit, Übersichtlichkeit und zum Design der Shapes CCS App erfahren.

Zu diesem Zweck wäre es schön, wenn Sie je nach persönlichen Möglichkeiten täglich die Anwendungen nutzen, testen und anschauen. Dabei sind diese Daten relevant:

- Videoanruf

Um Ihnen die Dokumentation während der Testphase zu erleichtern, haben wir für Sie ein Tagebuch vorbereitet. Am Ende der Testphase möchten wir zudem mit Ihnen ein Interview durchführen.

Um Ihnen eine Übersicht über die Funktionsweise der verschiedenen Geräte zu geben, haben wir für Sie diesen Leitfaden entwickelt. Am Ende des Leitfadens finden Sie unsere Kontaktdaten, sollten Sie weitere Fragen haben oder Hilfe benötigen.

Wir wünschen Ihnen viel Spaß beim Testen!

2. Checkliste Geräte

1x Tablet inklusive Ladekabel

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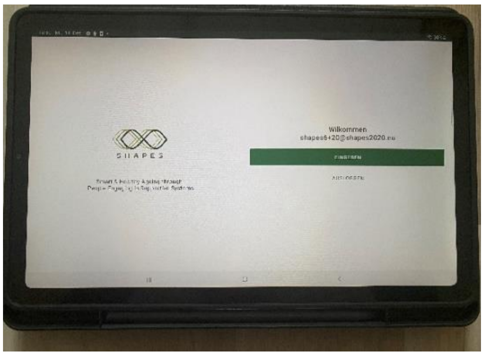
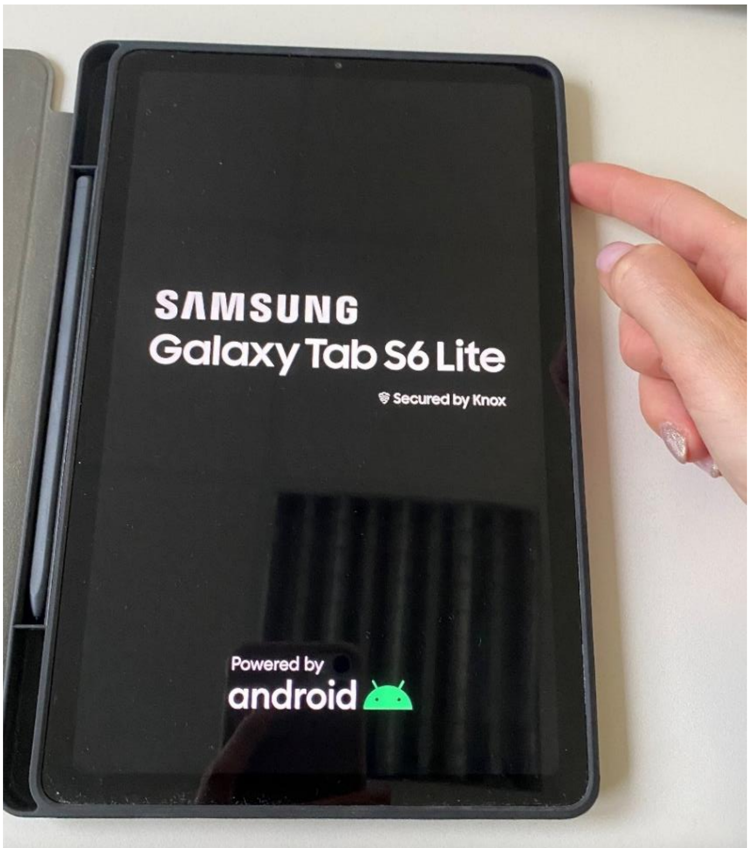


1. Tablet

1.1 Einschalten/Ausschalten

Halten Sie den schwarzen Knopf am rechten Rand des Tablets für mehrere Sekunden gedrückt.



Das Gerät wird nun gestartet und Sie gelangen nach einiger Zeit zum Sperrbildschirm:

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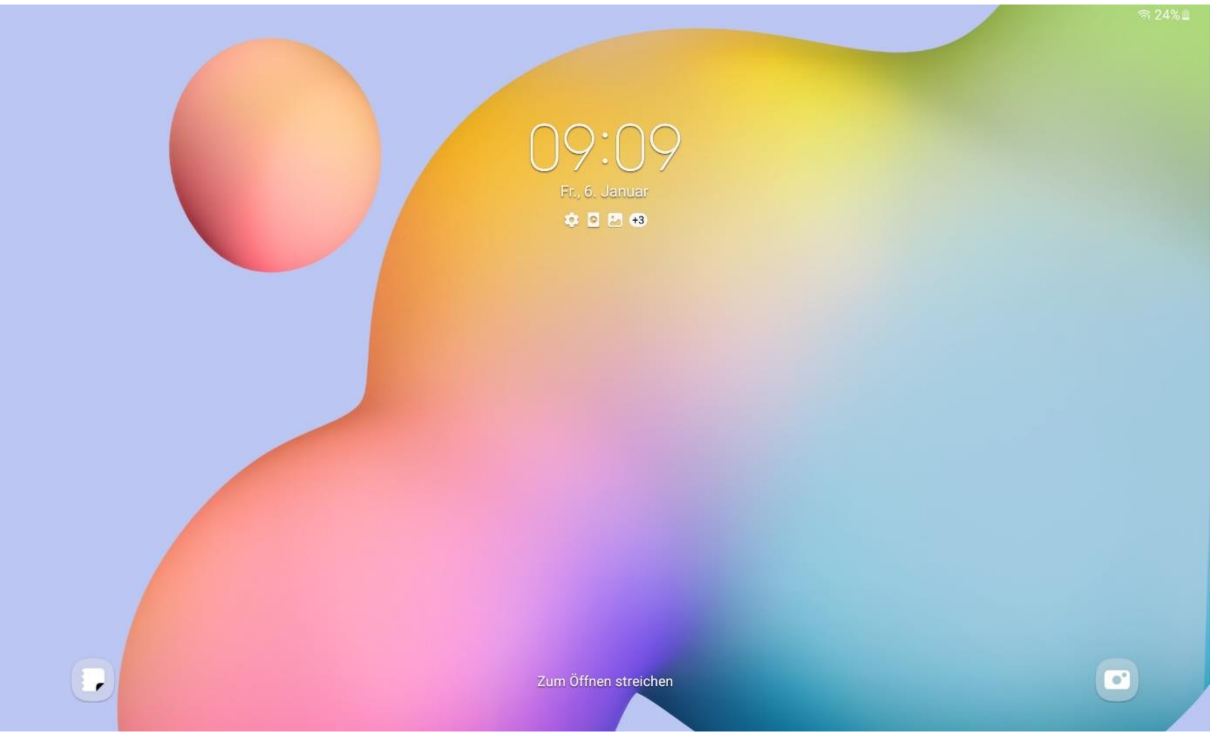
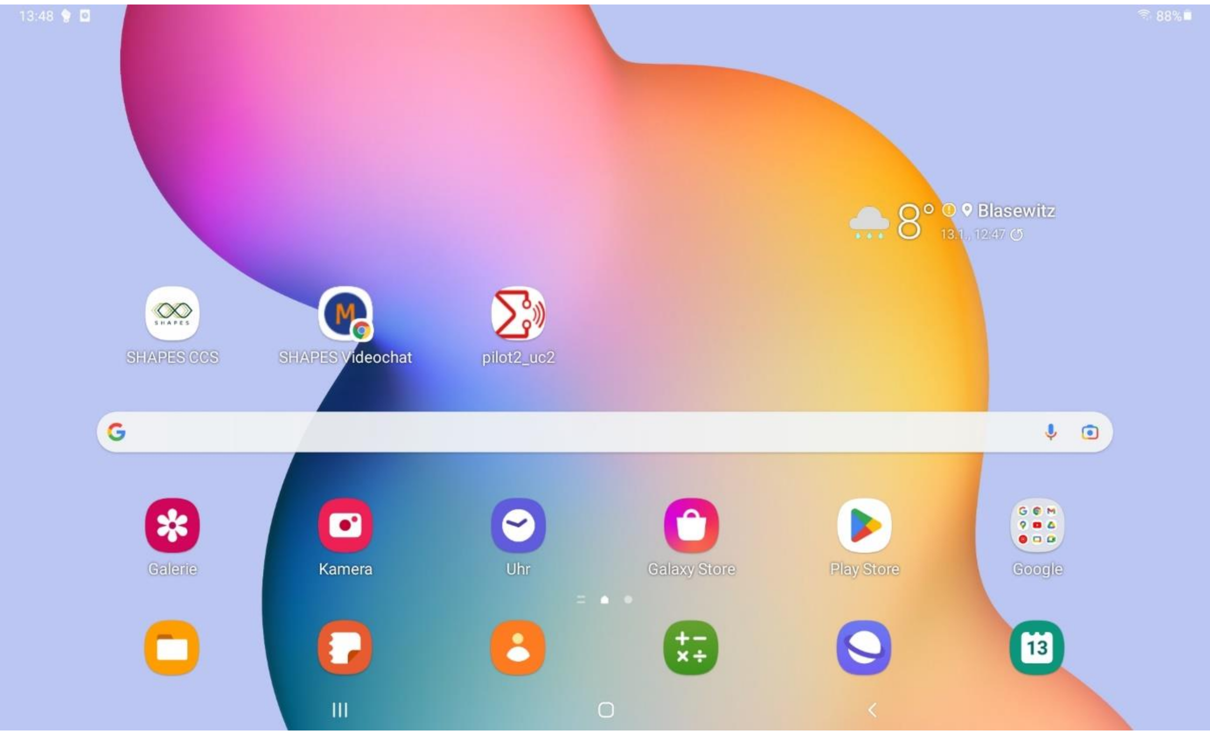


Streichen Sie über den Bildschirm, um zum Startbildschirm zu gelangen. Ist der Bildschirm des Tablets zwischendurch wieder „schwarz“ geworden, tippen Sie kurz auf den An-/Aus-Knopf am rechten Rand. Nun können Sie die einzelnen Anwendungen sehen, die sich auf dem Tablet befinden.



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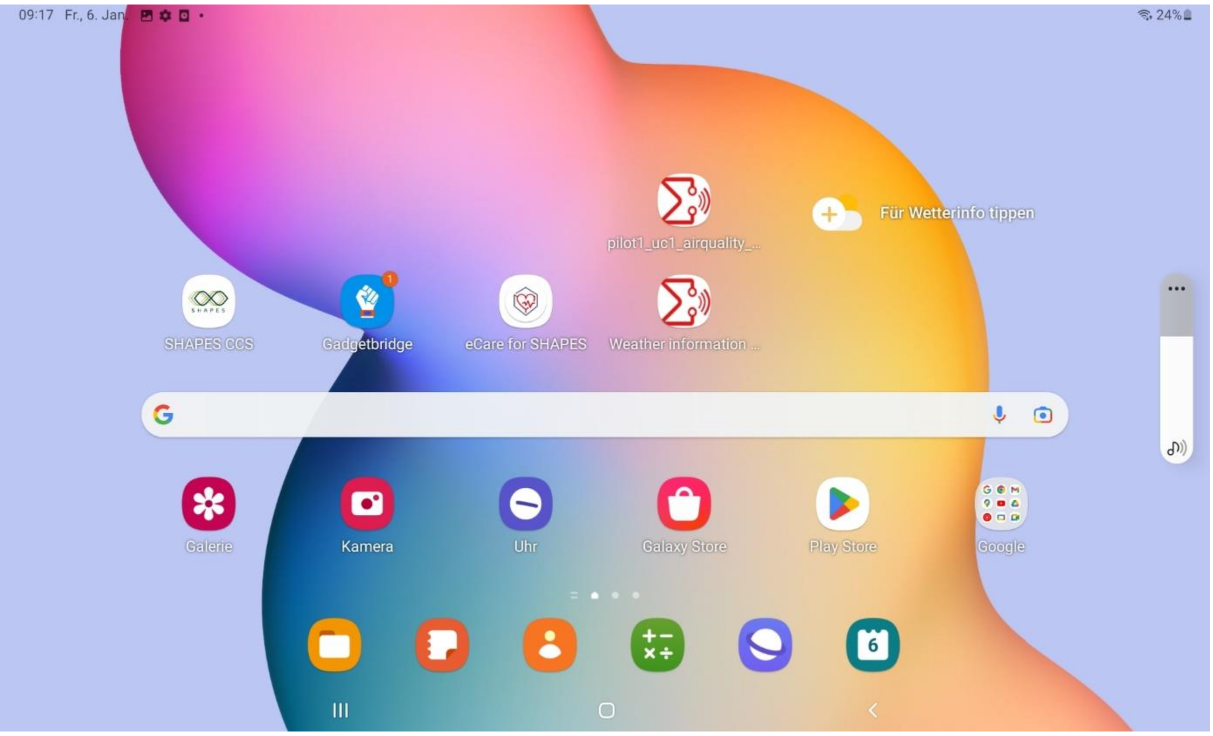
1.2 Bedienen

Durch die Touch-Funktion lässt sich das Tablet bedienen. Sie können dazu Ihren Finger benutzen oder den dazugehörigen Stift am Tablet. Um den Sperrbildschirm einzuschalten, tippen Sie kurz auf den An-/Ausschaltknopf.

Haben Sie eine Anwendung geöffnet und möchten zurück zum Hauptmenü, tippen Sie auf den viereckigen Knopf in der Mitte des Tablet (siehe Bild oben).

1.3 Lautstärke einstellen

Am rechten Rand des Tablets unterhalb des Ein- und Ausschaltknopfes befindet sich die Regelung für die Lautstärke. Drücken Sie den oberen Teil des Knopfes, um lauter zu stellen oder den unteren Teil um leiser zu stellen. Ihnen wird zeitgleich rechts auf dem Display ein Lautsprecher angezeigt und eine Skala.



1.4 Im Internet surfen

Tippen Sie auf das Symbol „Google“ (siehe Kreis). Anschließend öffnet sich das Fenster wie im nachfolgenden Bild. Tippen Sie auf „Chrome“.

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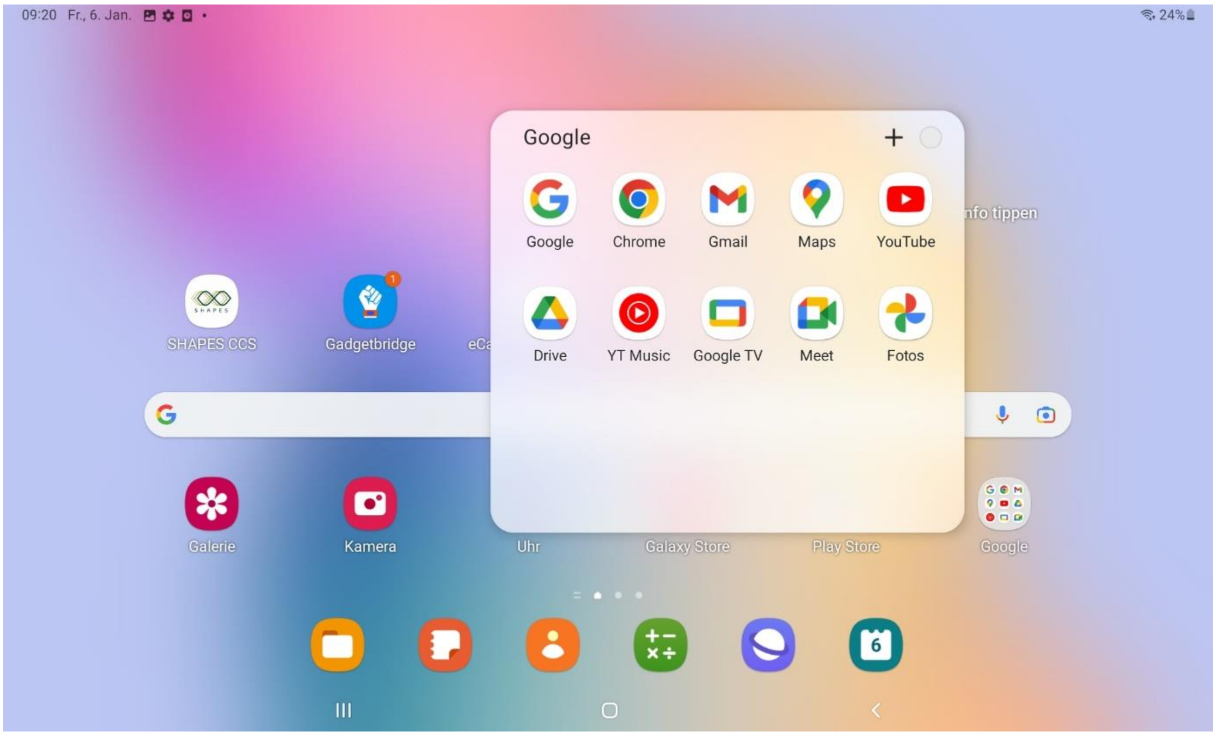
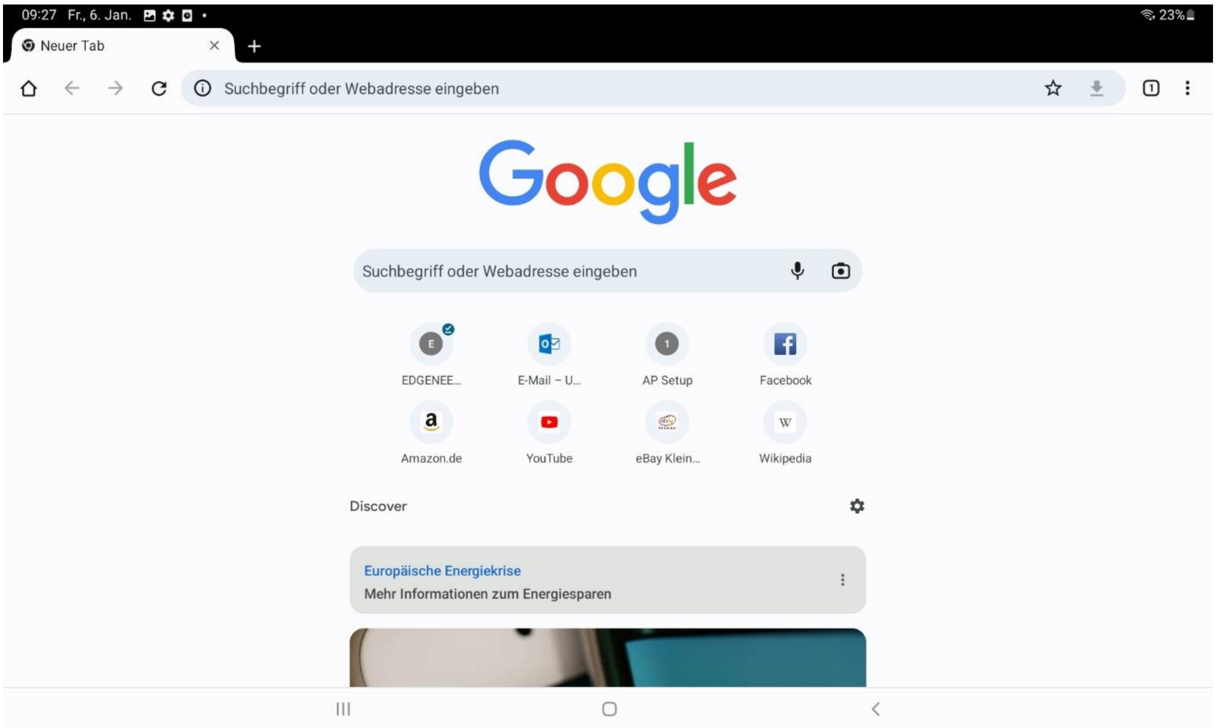


Anschließend öffnet sich der Internetbrowser und Sie können Ihre gewünschte www.Adressse.de oder einen Suchbegriff eingeben.



Tippen Sie auf das viereckige Symbol in der Mitte, um zurück zum Startbildschirm zu gelangen.

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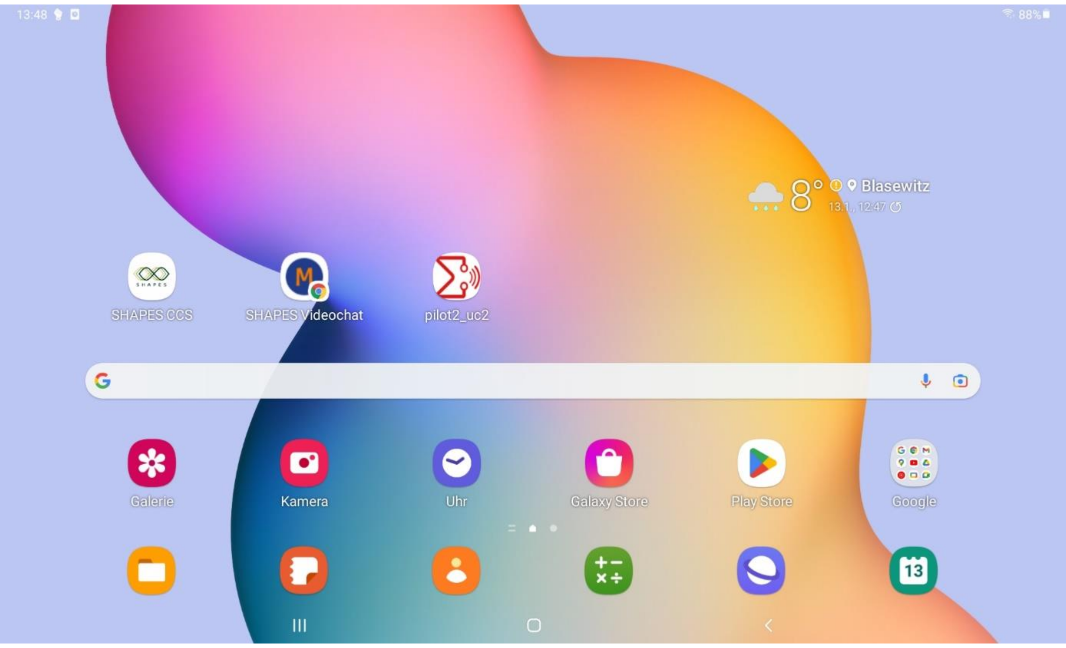
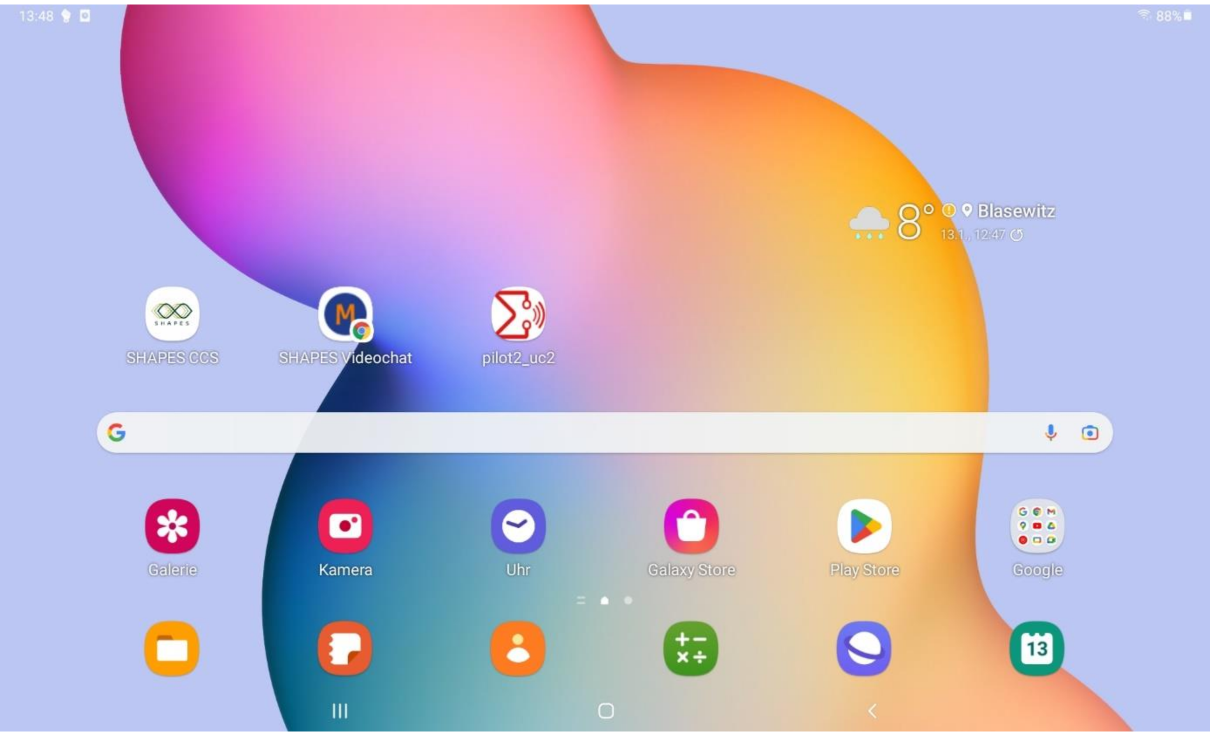
1.5 Übersicht SHAPES Anwendungen



Die Anwendungen, die Sie im großen Kreis sehen sind Anwendungen, die unmittelbar mit der SHAPES APP zusammenhängen. Die SHAPES CCS App im kleinen Kreis ist die Anwendung, die für die Testphase relevant ist.

a. Videotelefonie

Öffnen Sie auf Ihrem Startbildschirm die Anwendung „SHAPES Videochat“



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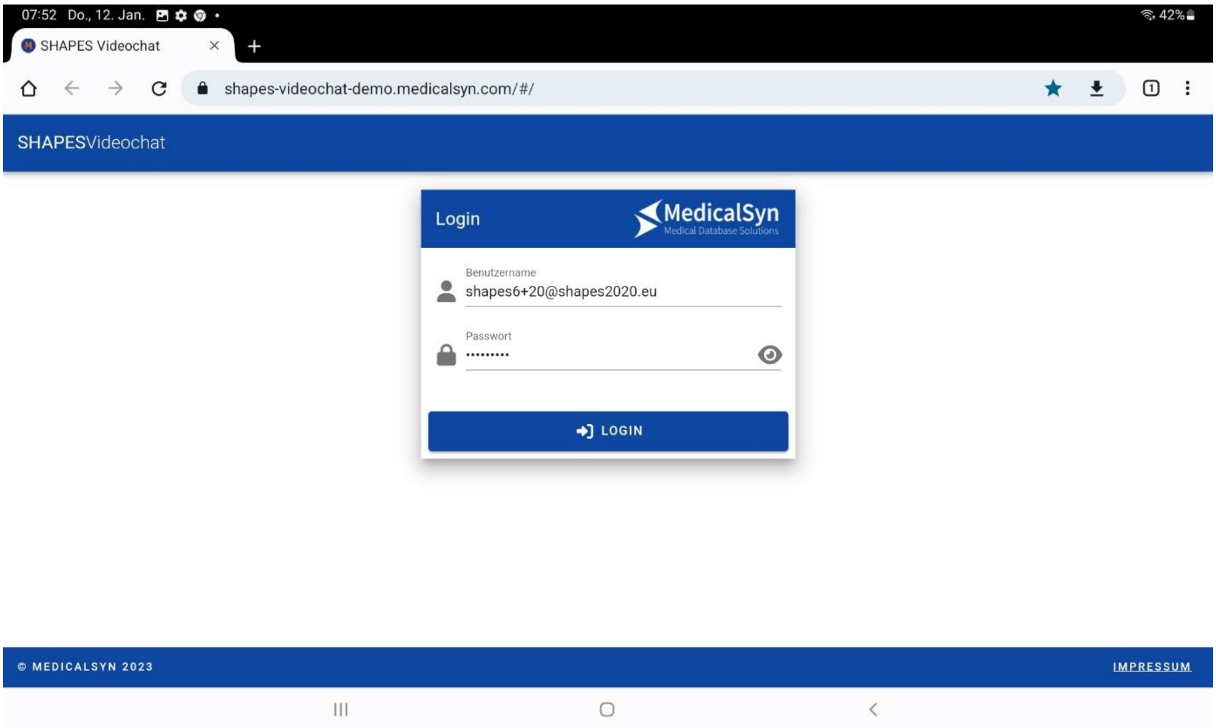
Anschließend öffnet sich der Internetbrowser. Geben Sie hier Ihren Benutzernamen und Ihr Passwort ein.

Benutzername:

Passwort:



Nach erfolgreichem Login öffnet sich das Adressbuch und Sie können Ihre zugeordneten Kontakte sehen. Wählen Sie einen Kontakt aus und drücken Sie auf den blauen Hörer, um Ihren Kontakt anzurufen. Beim angerufenen Teilnehmer wird Telefonhörer grün. Nach dem Klick auf den Hörer werden Sie gefragt, ob Sie den Zugriff auf Mikrofon und Kamera erlauben. Der Zugriff auf Mikrofon und Kamera muss erlaubt werden.

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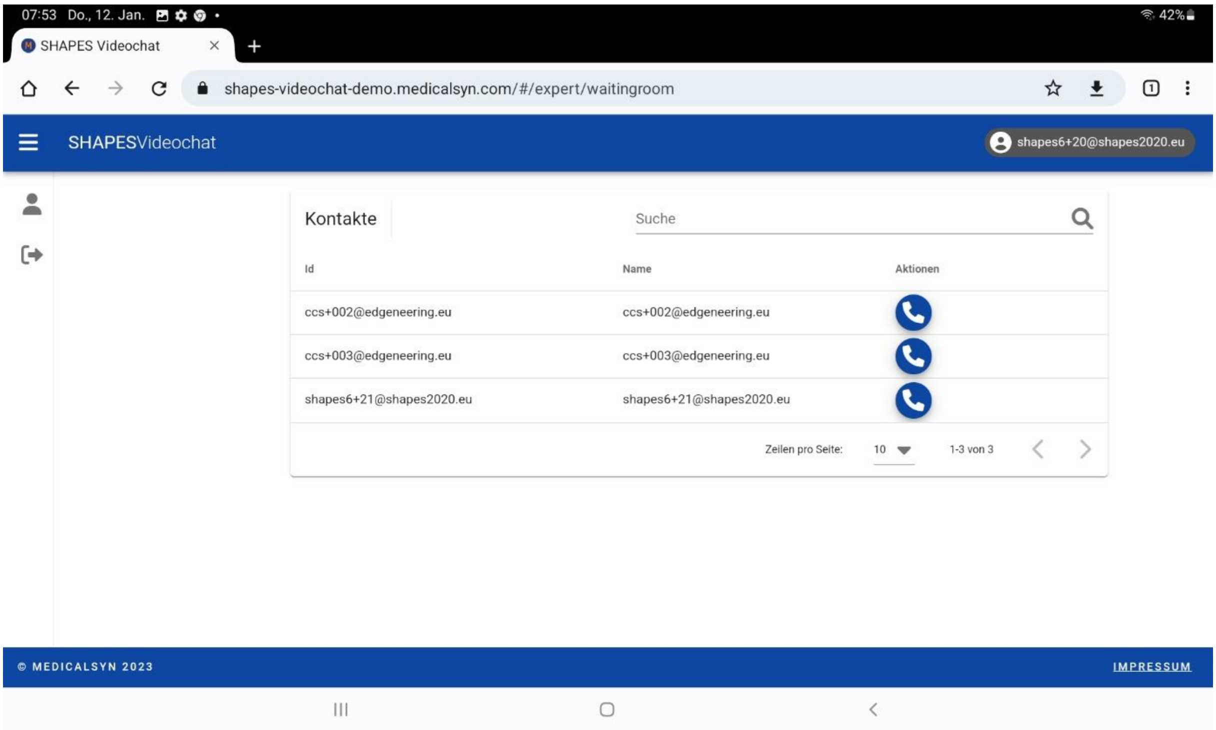
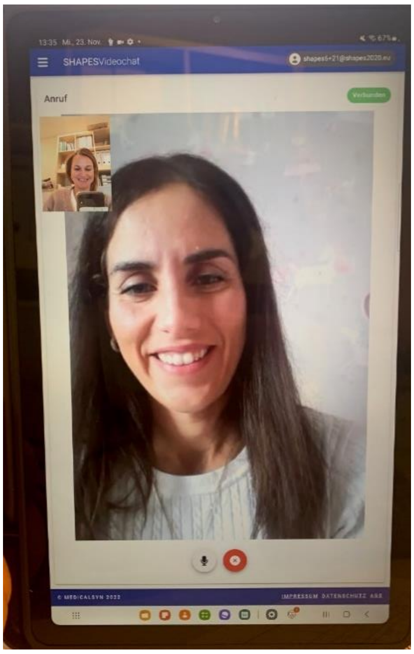


Bei erfolgreicher Verbindung können Sie und Ihr Kontakt sich sehen und miteinander sprechen. Es erscheint rechts ein grüner Button „verbunden“.



Möchten Sie das Telefonat beenden drücken Sie auf den roten Knopf unten. Sie gelangen zum Adressbuch zurück.

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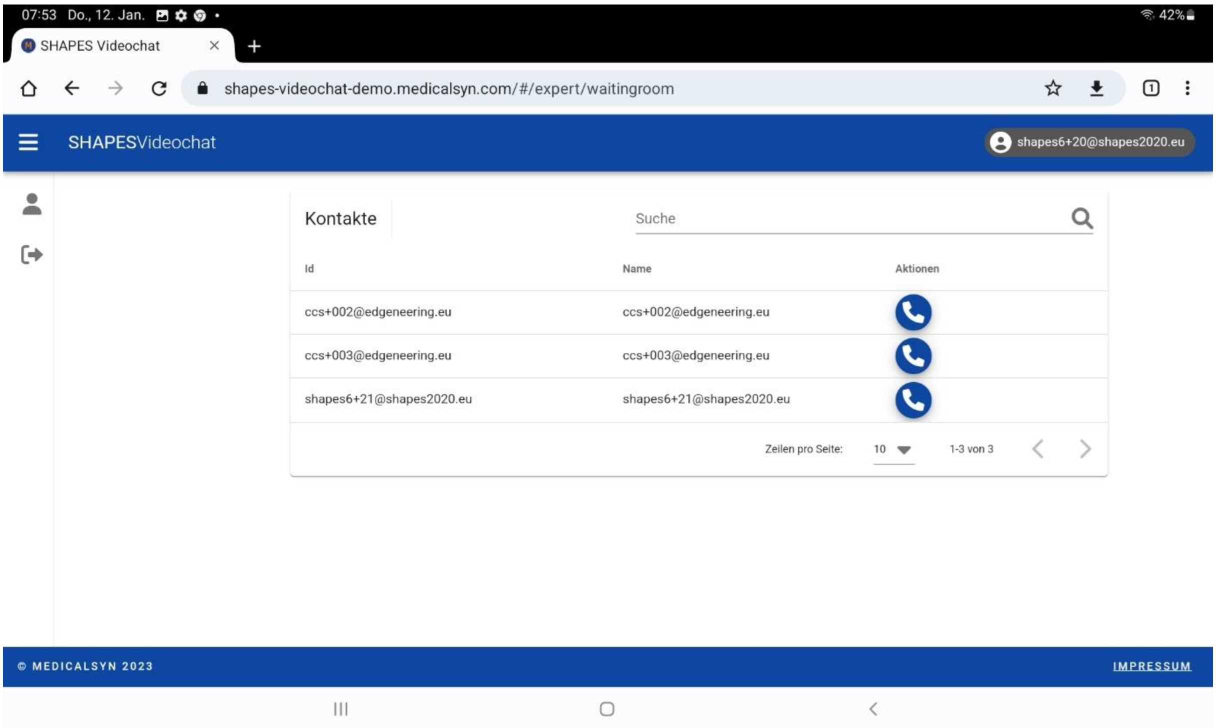
Um sich aus der Anwendung „SHAPES Videochat“ abzumelden, klicken Sie auf den Pfeil links ().

Tippen Sie auf das viereckige Symbol in der Mitte, um zurück zum Startbildschirm zu gelangen.



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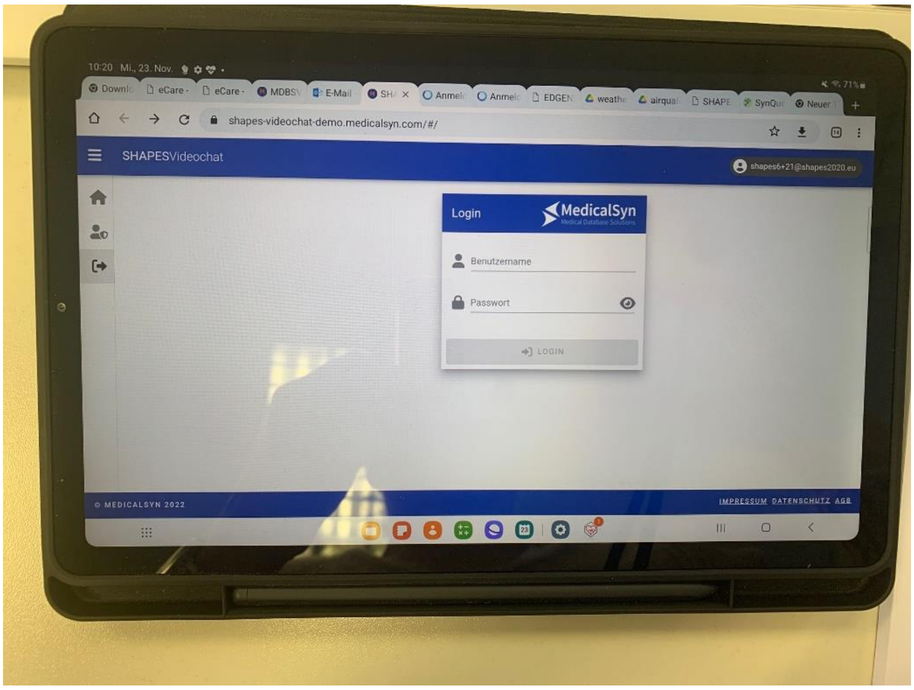
Annex 39

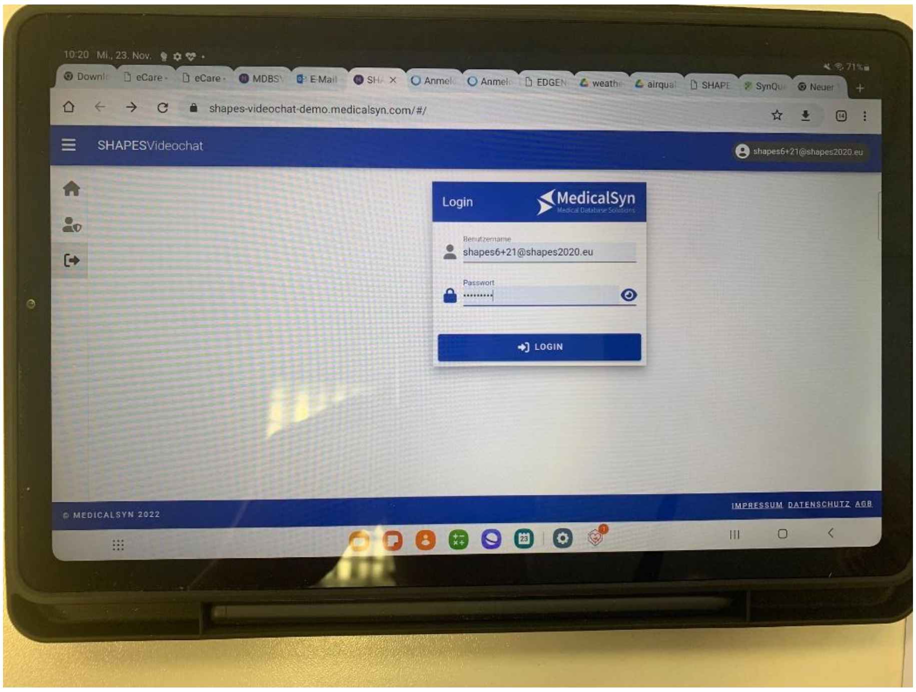
UC-PT1-003 Test protocol phase 4

Date: 23.11.2022

- Demo version received on 22.11.2023
- Internal test on 23.11.2022 between user



Home demo version



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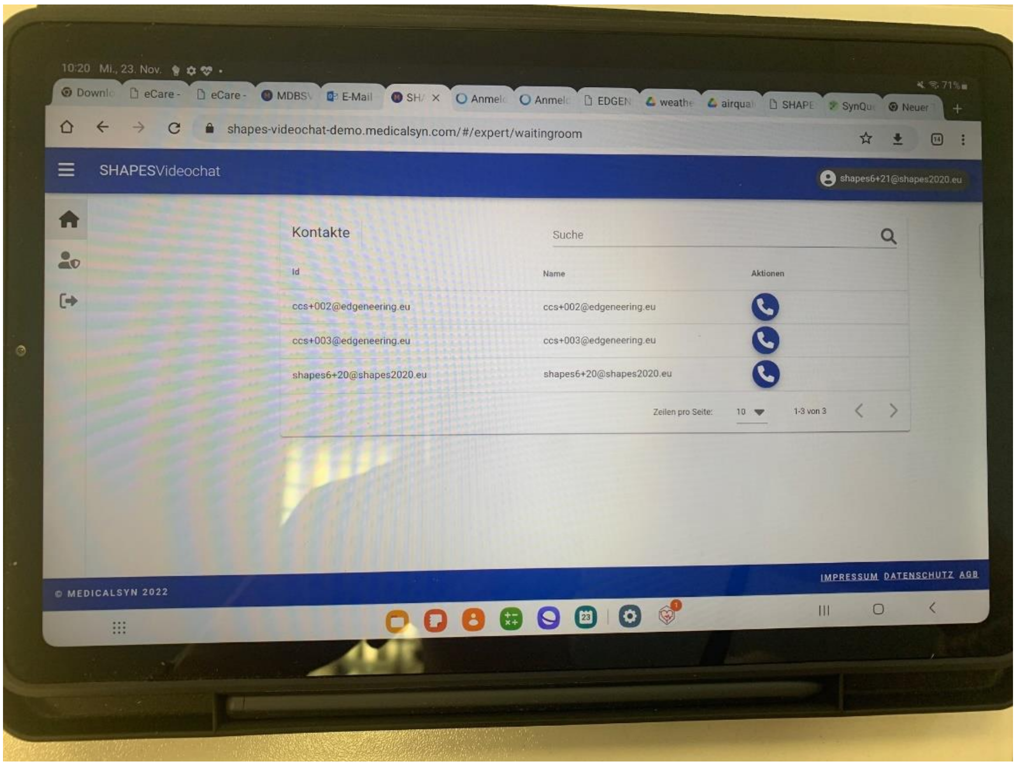
Login with SHAPES ID



Adress book

Functions	Outcome
After successful login, the address book opens.	Works as described
A contact can be selected in the address book and video telephony is opened by selecting it via the blue telephone button.	Works as described
The symbol of the telephone handset of the called subscriber turns green.	Works as described
The connection is established by clicking on the green telephone receiver.	Works as described

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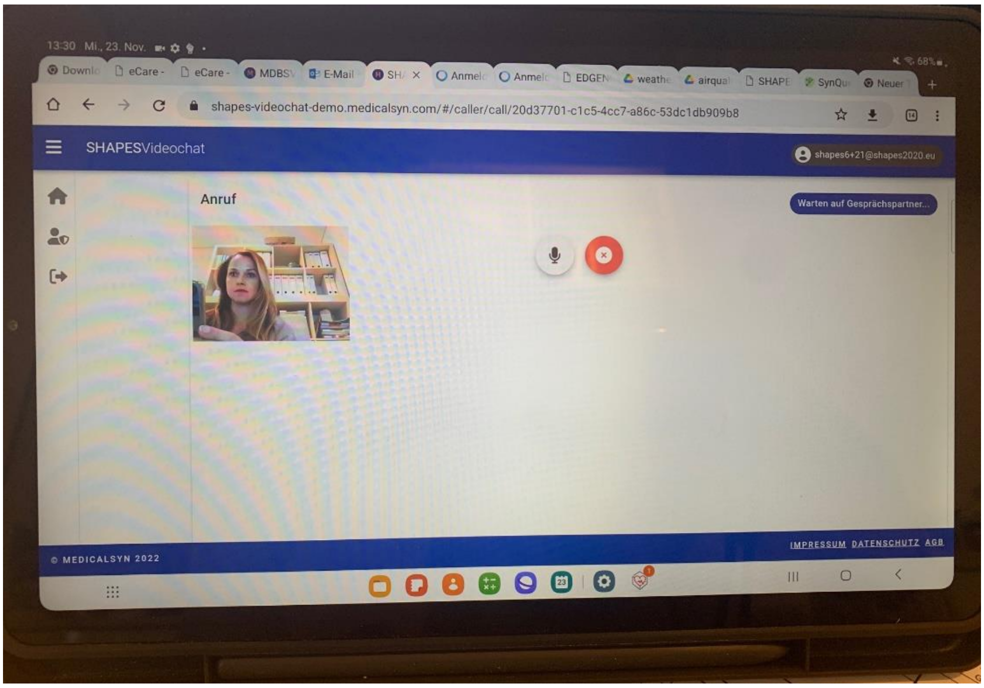
The green handset symbol is the sign/notification that a call is being made. The symbol changes colour.	Works as described
During the first video telephony, you are asked whether the camera and microphone can be accessed during the connection. If confirmed, a connection is established. If you refuse, no connection is established.	Works as described
Telephone call with video can be made	Works as described
The connection is terminated by clicking on the red button with the cross.	Works as described

Furher notes:

➔ Other notifications for the called person are not foreseen. Therefore, an appointment between the participants must be agreed in advance, otherwise the called person does not know that it is "ringing".



Waiting for called person.

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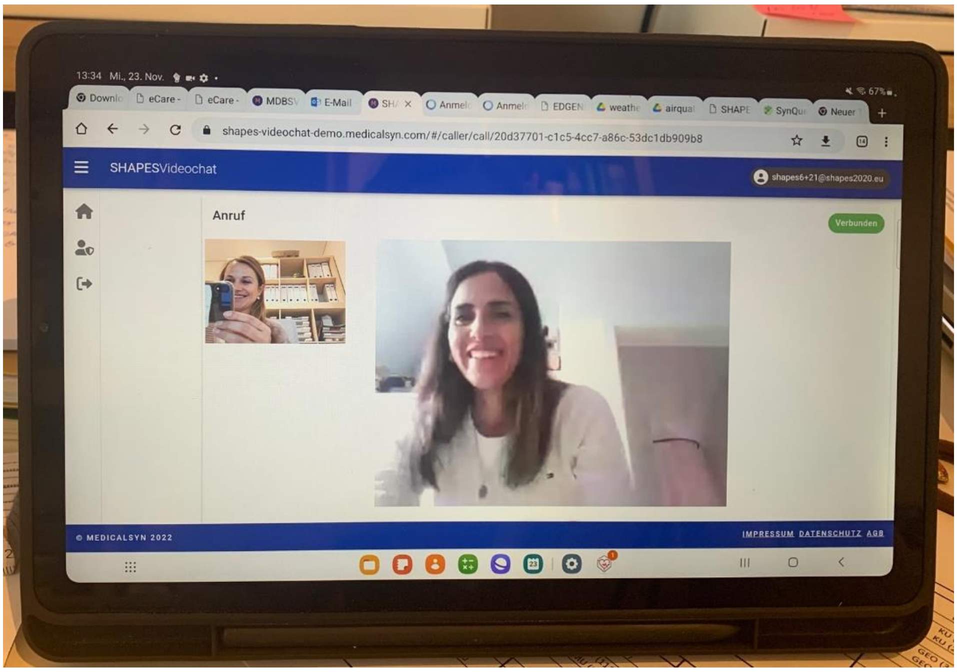
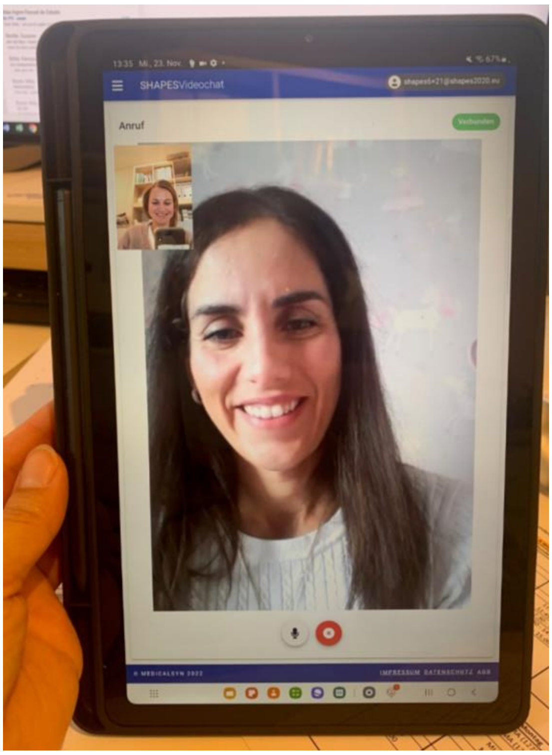


Successful connection



The connection is terminated by clicking on the red button with the cross.

Feedback after first test:

- ➔ Procedure logical and understandable
- ➔ Functions are all possible (see Table 1)
- ➔ Connection works
- ➔ Picture and sound good quality

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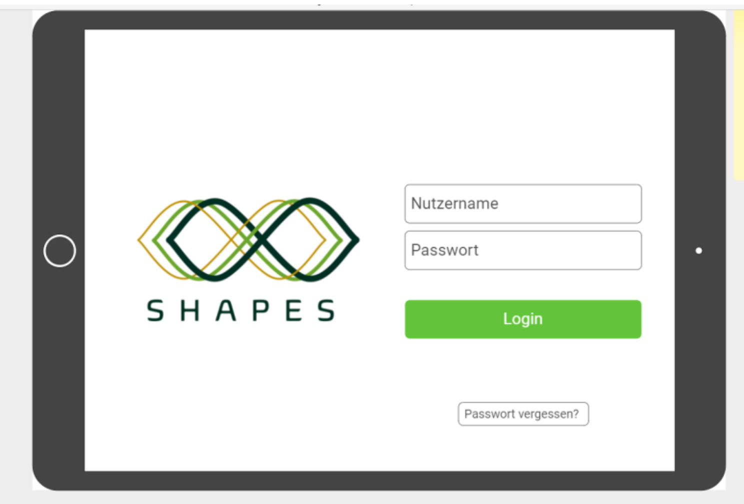
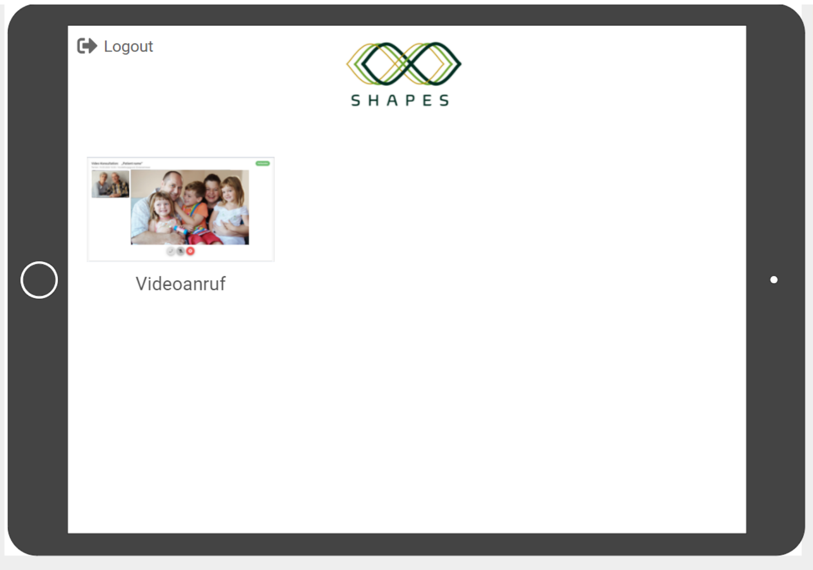
Recommendations:

➔ Before logging into the MedicalSyn demo version, a login into the SHAPES frontend app should take place so that the user logs in only once and the solution is thus integrated into the SHAPES app: After successfully logging into the SHAPES app (home page), the applications needed for seniors were displayed. In this case study, only the video telephony application. Clicking on this link button takes the user to the video telephony application.



Login with SHAPES ID



➔ Satisfaction survey after the end of the video call: The quality of the video call should be asked and if there are any comments from the user, the area of dissatisfaction should be asked about.

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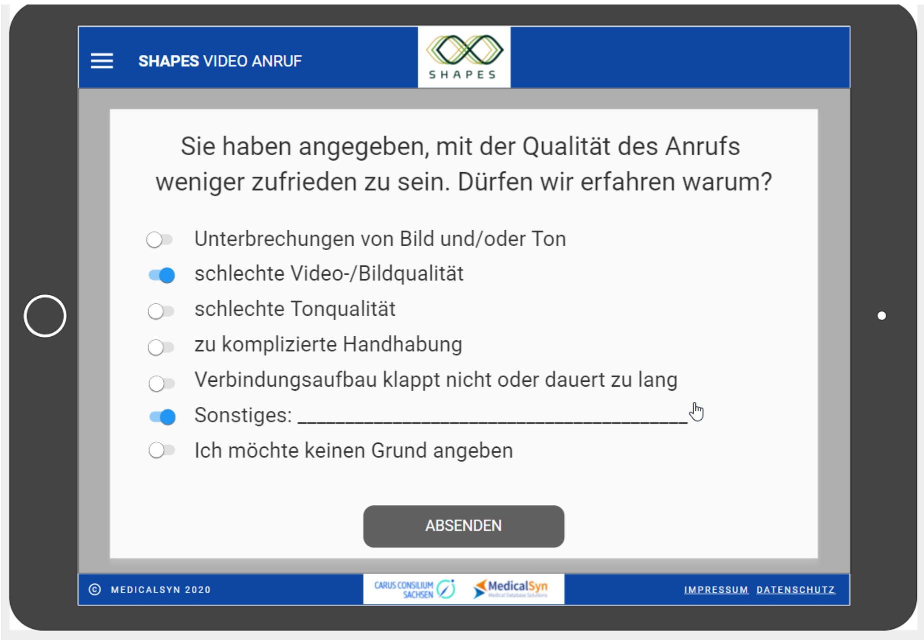

SUS für UC003:

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Kreuzen Sie bitte für jede der folgenden Aussagen ein Kästchen an, das Ihre Reaktion auf die Technologie ("SHAPES Pilot 1 Fallbeispiel 3 - Videotelefonie") heute am besten beschreibt.

		Stimme überhaupt nicht zu	Stimme nicht zu	Weder noch	Stimme zu	Stimme voll und ganz zu
1	Ich kann mir sehr gut vorstellen, das System regelmäßig zu nutzen.	1 *(0)*	2 *(1)*	3 *(2)*	4 *(3)*	5 *(4)*
2	Ich empfinde das System als unnötig komplex.	1 *(4)*	2 *(3)*	3 *(2)*	4 *(1)*	5 *(0)*
3	Ich empfinde das System als einfach zu nutzen.	1	2	3	4	5
4	Ich denke, dass ich technischen Support brauchen würde, um das System zu nutzen.	1	2	3	4	5
5	Ich finde, dass die verschiedenen Funktionen des Systems gut integriert sind.	1	2	3	4	5
6	Ich finde, dass es im System zu viele Inkonsistenzen gibt.	1	2	3	4	5
7	Ich kann mir vorstellen, dass die meisten Leute das System schnell zu beherrschen lernen.	1	2	3	4	5
8	Ich empfinde die Bedienung als sehr umständlich.	1	2	3	4	5
9	Ich habe mich bei der Nutzung des Systems sehr sicher gefühlt.	1	2	3	4	5
10	Ich musste eine Menge Dinge lernen, bevor ich mit dem System arbeiten konnte.	1	2	3	4	5

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Annex 40

UC-PT1-003 SUS Score phase 4

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_40_PT1_UC003_phase4_SUS.xlsx

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Annex 41

UC-PT1-003 – Number of connections, KPI3 and KPI4

participants	week 3		week 4	week 5	week 6	week 7	week 9	week 10	Number video telephony
1	0		0	0	1	0	0	0	**1**
2	0		0	0	1	1	0	0	**2**
3	0		0	0	0	0	0	1	**1**
4	0		0	0	0	0	2	1	**3**
5	0		0	0	0	9	2	0	**11**
6	0		0	0	0	0	1	0	**1**
7	0		0	0	0	0	1	0	**1**
8	0		0	0	0	0	1	0	**1**
9	0		0	0	0	0	1	0	**1**
10	1		0	2	0	3	2	0	**8**
11	1		0	2	0	4	2	0	**9**
12	0		0	0	0	0	0	0	**0**
13	0		0	0	0	5	0	0	**5**
									44

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Annex 42

UC-PT1-003 Evidence for KPI 5

Number of assessment	Date	Duration	Level of satisfaction	Reason
1	03/02/2023 00:00:00	7 min	--	
2	03/02/2023 00:00:00	5 min	--	
3	02/14/2023 00:00:00	2 min	NeitherSatisfiedNorDissatisfied	
4	02/13/2023 00:00:00	2 min	Satisfied	
5	03/05/2023 00:00:00	2 min	NeitherSatisfiedNorDissatisfied	
6	01/31/2023 00:00:00	3 min	NeitherSatisfiedNorDissatisfied	
7	02/13/2023 00:00:00	5 min	Satisfied	
8	03/05/2023 00:00:00	1 min	--	
9	02/03/2023 00:00:00	1 min	NeitherSatisfiedNorDissatisfied	

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10	03/08/2023 00:00:00	3 min	Satisfied	
11	02/13/2023 00:00:00	2 min	NeitherSatisfiedNorDissatisfied	
12	02/13/2023 00:00:00	3 min	--	
13	02/13/2023 00:00:00	2 min	Satisfied	
14	02/06/2023 00:00:00	5 min	Satisfied	
15	01/17/2023 00:00:00	2 min	--	
16	02/13/2023 00:00:00	4 min	Satisfied	
17	02/14/2023 00:00:00	10 min	Satisfied	
18	02/13/2023 00:00:00	1 min	NeitherSatisfiedNorDissatisfied	
19	02/13/2023 00:00:00	1 min	--	
20	02/13/2023 00:00:00	3 min	NeitherSatisfiedNorDissatisfied	

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21	03/03/2023 00:00:00	3 min	Satisfied	
22	03/03/2023 00:00:00	3 min	Satisfied	
			6	**No evaluation**
			9	**Satisfied**
			7	**NeitherSatisfiedNorDissatisfied**
			0	**Dissatisfied**
			22	**Connections**

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Annex 43

UC-PT1-003 SUS Score phase 5

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_43_PT1_UC003_phase5_SUS.xlsx

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Annex 44

UC-PT1-003 Harmonised data

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_44_PT1_UC003_Harmonised-Psychosocial-Data.xlsx

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Annex 45

UC-PT1-003 Final interviews phase 5

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_45_UC-PT1-003-final-interviews.xlsx

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Annex 46

UC-PT1-003 Replicating by OMNITOR Harmonised Data

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_46_UC-PT1-003-ReplicatingOMN-Harmonised-Psychosocial-Data.xlsx

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Annex 47

UC-PT1-003 Replicating by OMNITor Final interviews

1) Pilot 1 UC003 final interview participants

Digital solutions:

- SHAPES App in general / Tablet
- Videocall solution

Now that you have been able to test the individual applications of pilot 1 UC001 in your own home environment, we would like you to answer a few more questions in summary.

Socio-demographic information:

age: Late 60, Mid 70, Mid 70, Mid 70, Late 70, Early 80, Mid 80, Late 80

gender: Male, Female, Female, Female, Female, Male, Female, Female

role (care receiver, care giver, researcher): Care receiver (participants)

Experience with digital applications:

- ☐ high (daily use of digital applications) * (5 Participants)
- ☐ medium (at least 1x per week)
- ☐ low (at least 1x every 2 weeks) * (2 Participants)
- ☐ none at all (no experience at all) * (1 Participant)

Marital status:

- ☐ Married *(3 Participants)
- ☐ living together
- ☐ Single (never been married)
- ☐ Living separately
- ☐ Divorced * (2 Participants)
- ☐ Widowed * (3 Participants)

Education:

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- ☐ University degree *(2 Participants)
- ☐ Higher education entrance qualification (general or subject-related) *(6 Participants)
- ☐ Intermediate school leaving certificate
- ☐ Secondary school leaving certificate
- ☐ Qualified lower secondary school leaving certificate

Do you get help from a family member in daily activities?

- ☐ Never *(1 Participant)
- ☐ hardly ever *(4 Participants)
- ☐ sometimes *(1 Participant)
- ☐ often

A household may have different sources of income and it may be that more than one household member contributes to the income. Think about the total monthly income of your household: Is your household making ends meet?

- ☐ Very easy *(5 Participants)
- ☐ Easy *(2 Participants)
- ☐ Fairly easy *(1 Participant)
- ☐ With some difficulty
- ☐ With difficulties
- ☐ With great difficulty

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Perception and understanding

What is SHAPES from your point of view?

A project that creates an adaptive system, where a communication system is a part of it.
A project, financed by EU (European Union).

Were the individual applications understandable for you?

Yes.

Were you able to operate the individual applications?

Yes.

Do you find the visualisation attractive?

Yes.

What do you like? / What do you enjoy?

It was easy to use.
Not too many settings.

Why?

See above.

What do you not like?

Sometimes some calls could have some pixels.

Interviewer: Did you try another other network?

- Yes, it could work better and the pixelation stopped.

Why?

See above.

Are you missing anything (e.g. information, a display, a key, a function)?

Yes, one time I turned off my camera by mistake, is it possible to make it easier to find how to turn it on again?

Interaction / Intuition / Function

Was the handling comprehensible and understandable for you??

Yes.

Were you able to find specific information within the applications?

Yes.

Which functions were understandable?

Video and how to call.

...and which not?

How to start the video application. Was not too intuitive to have to start an app and then press another button for the video application.

Would you like to have reminders and recommendations? How many per day?

No comment…

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Appearance / Layout

In general, how did you like the appearance / layout of the applications?

It was easy to get a general overview of the application. Not too many settings.

Some users were used to using another communication tool, which some of them could perceive as too having too many settings, almost so they felt that they were not in control. This was not the case in this instance, with SHAPES.

Were you able to read / recognise all the information?

Yes.

How do you like the colour scheme?

Yes.

Were the contrasts good?

- Yes.

Interviewer: Did someone try high-contrast settings? I.e. Yellow on black, black on white.

- Yes, most have done that but opted not necessary to use it.

Was the presentation well-arranged?

Yes.

Did you feel overwhelmed or was it clear and well-structured?

It was clear and well-structured.

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In your opinion, should something be changed in the appearance?

Yes, the (front-end app), should open the video call app once you log in.

General feedback

What do you think overall about SHAPES, the use case and the applications presented?

All participants stated that they had a good time, and thought it was fun to be able to participate in SHAPES.

One participant stated that she got better contact with her sister thanks to this project.
"It's fun that it requires a project for us to talk again".

How do you rate it, how much training and support will you need to use these digital solutions?

All participants except one stated they needed very little training.

One stated, that due to lacking knowledge on how to use a tablet, a little more training was needed. But in the end, it was quite easy to manage.

Which functions / applications / digital solutions are most interesting and useful for you?

Video call…

Which functions / applications / digital solutions are useless from your point of view? Which applications do you not need and why?

None?...

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Would you continue to use the tested applications?

Yes.

One of the interviewees stated that ‘no’ or ‘maybe’, but this was because of the close proximity to their relatives. But could also see the use if one does not have the same close proximity to their relatives.

Do you find it generally useful to develop a specific platform for healthy ageing?

Yes

If the SHAPES APP and the individual applications were to exist in the future, would you be willing to pay money for them?

How much?
Can it be free?

Under what conditions would you be willing to use the SHAPES app in the future?

- The same condition if it was a free app.

Interviewer: If the government/municipalities, procure this (i.e. pay by municipalities or County Councils), you will be willing to use this in the future?

- Unanimously “Yes“.

Each interview did a separate System Usability Scale (SUS)

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		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
1	I think that I would like to use this technology frequently	1	2	3	4	5
2	I found this technology unnecessarily complex	1	2	3	4	5
3	I thought this technology was easy to use	1	2	3	4	5
4	I think that I would need the support of a technical person to be able to use this technology	1	2	3	4	5
5	I found the various functions in this technology were well integrated	1	2	3	4	5
6	I thought there was too much inconsistency in this technology	1	2	3	4	5
7	I would imagine that most people would learn to use this technology very quickly	1	2	3	4	5
8	I found this technology very cumbersome (awkward) to use	1	2	3	4	5
9	I felt very confident using this technology	1	2	3	4	5
10	I needed to learn a lot of things before I could get going with this technology	1	2	3	4	5

		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree

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1	I think that I would like to use this technology frequently	1	2	3	4	5

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2	I found this technology unnecessarily complex	1	2	3	4	5
3	I thought this technology was easy to use	1	2	3	4	5
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3	I thought this technology was easy to use	1	2	3	4	5
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4	I think that I would need the support of a technical person to be able to use this technology	1	2	3	4	5
5	I found the various functions in this technology were well integrated	1	2	3	4	5
6	I thought there was too much inconsistency in this technology	1	2	3	4	5
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10	I needed to learn a lot of things before I could get going with this technology	1	2	3	4	5

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

2) Pilot 1 UC003 final interview participants

Digital solutions:

- SHAPES App in general / Tablet
- Videocall solution

Now that you have been able to test the individual applications of pilot 1 UC001 in your own home environment, we would like you to answer a few more questions in summary.

Socio-demographic information:

age: Mid 60, Late 60, Mid 70, Mid 70, Mid 70, Mid 70

gender: Female, Male, Female, Female, Female, Female

role (care receiver, care giver, researcher): Care receiver (Participants)

Experience with digital applications:

- ☐ high (daily use of digital applications) * (6 Participants)
- ☐ medium (at least 1x per week)
- ☐ low (at least 1x every 2 weeks)
- ☐ none at all (no experience at all)

Marital status:

- ☐ Married *4(Participants)
- ☐ living together
- ☐ Single (never been married)
- ☐ Living separately
- ☐ Divorced *2 (Participants)
- ☐ Widowed

Education:

- ☐ University degree
- ☐ Higher education entrance qualification (general or subject-related) *(5 Participants)
- ☐ Intermediate school leaving certificate *(1 Participant)

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- ☐ Secondary school leaving certificate
- ☐ Qualified lower secondary school leaving certificate

Do you get help from a family member in daily activities?

- ☐ Never *(2 Participants)
- ☐ hardly ever *4(Participants)
- ☐ sometimes
- ☐ often

A household may have different sources of income and it may be that more than one household member contributes to the income. Think about the total monthly income of your household: Is your household making ends meet?

- ☐ Very easy *(5 Participants)
- ☐ Easy
- ☐ Fairly easy
- ☐ With some difficulty
- ☐ With difficulties
- ☐ With great difficulty

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

Perception and understanding

What is SHAPES from your point of view?

Communication platform or aid platform for older adults.

Were the individual applications understandable for you?

Yes, weren't so many settings.

Were you able to operate the individual applications?

Yes.

Do you find the visualisation attractive?

It was attractive, nothing to add really.

What do you like? / What do you enjoy?

It was easy to use.

Why?

See above.

What do you not like?

The SU-address was harder to grasp. Would prefer that it stood "Anna" for example instead of SUXY.

Why?

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See above.

Are you missing anything (e.g. information, a display, a key, a function)?

None.

Some participants just wanted additional product keys, to call grandchildren, etc.

Interaction / Intuition / Function

Was the handling comprehensible and understandable for you??

Yes, however unused to enter product keys when a relative/friend should register the app.

Also would prefer if it was like a phone number instead of SUXY.

Were you able to find specific information within the applications?

Yes.

Which functions were understandable?

The call function.

...and which not?

How to add contacts.

Would you like to have reminders and recommendations? How many per day?

None… No comment…

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

Appearance / Layout

In general, how did you like the appearance / layout of the applications?

Generally good, it was great to be able to increase text and button size. (A feature every participant used).

Were you able to read / recognise all the information?

Yes.

Especially after the increased size of the text.

How do you like the colour scheme?

Yes.

Were the contrasts good?

Yes.

Was the presentation well-arranged?

Yes.

Did you feel overwhelmed or was it clear and well structured?

Yes.

In your opinion, should something be changed in the appearance?

Nothing major, maybe settings?
Some participants thought it was hard to find the increased button size at first, but also stated that they managed to do it themselves.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

General feedback

What do you think overall about SHAPES, the use case and the applications presented?

Yes, it was fun to be a part of this project.

How do you rate it, how much training and support will you need to use these digital solutions?

Very little…

Which functions / applications / digital solutions are most interesting and useful for you?

The call and video of course.

Which functions / applications / digital solutions are useless from your point of view? Which applications do you not need and why?

None…

Would you continue to use the tested applications?

Yes.

Do you find it generally useful to develop a specific platform for healthy ageing?

Yes.

If the SHAPES APP and the individual applications were to exist in the future, would you be willing to pay money for them?

Depends on the price…

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Under what conditions would you be willing to use the SHAPES app in the future?

To have a video call.
Interviewer: "If it was procured and paid for by municipalities, would you like to use it? "

Unanimously "Yes".

Each interview did a separate System Usability Scale (SUS)

		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
1	I think that I would like to use this technology frequently	1	2	3	4	5
2	I found this technology unnecessarily complex	1	2	3	4	5
3	I thought this technology was easy to use	1	2	3	4	5
4	I think that I would need the support of a technical person to be able to use this technology	1	2	3	4	5
5	I found the various functions in this technology were well integrated	1	2	3	4	5
6	I thought there was too much inconsistency in this technology	1	2	3	4	5
7	I would imagine that most people would learn to use this technology very quickly	1	2	3	4	5
8	I found this technology very cumbersome (awkward) to use	1	2	3	4	5
9	I felt very confident using this technology	1	2	3	4	5

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10	I needed to learn a lot of things before I could get going with this technology	1	2	3	4	5

		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
1	I think that I would like to use this technology frequently	1	2	3	4	5
2	I found this technology unnecessarily complex	1	2	3	4	5
3	I thought this technology was easy to use	1	2	3	4	5
4	I think that I would need the support of a technical person to be able to use this technology	1	2	3	4	5
5	I found the various functions in this technology were well integrated	1	2	3	4	5
6	I thought there was too much inconsistency in this technology	1	2	3	4	5
7	I would imagine that most people would learn to use this technology very quickly	1	2	3	4	5
8	I found this technology very cumbersome (awkward) to use	1	2	3	4	5
9	I felt very confident using this technology	1	2	3	4	5
10	I needed to learn a lot of things before I could get going with this technology	1	2	3	4	5

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		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
1	I think that I would like to use this technology frequently	1	2	3	4	5
2	I found this technology unnecessarily complex	1	2	3	4	5
3	I thought this technology was easy to use	1	2	3	4	5
4	I think that I would need the support of a technical person to be able to use this technology	1	2	3	4	5
5	I found the various functions in this technology were well integrated	1	2	3	4	5
6	I thought there was too much inconsistency in this technology	1	2	3	4	5
7	I would imagine that most people would learn to use this technology very quickly	1	2	3	4	5
8	I found this technology very cumbersome (awkward) to use	1	2	3	4	5
9	I felt very confident using this technology	1	2	3	4	5
10	I needed to learn a lot of things before I could get going with this technology	1	2	3	4	5

		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
1	I think that I would like to use this technology frequently	1	2	3	4	5

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

		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
1	I think that I would like to use this technology frequently	1	2	3	4	5
2	I found this technology unnecessarily complex	1	2	3	4	5
3	I thought this technology was easy to use	1	2	3	4	5

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4	I think that I would need the support of a technical person to be able to use this technology	1	2	3	4	5
5	I found the various functions in this technology were well integrated	1	2	3	4	5
6	I thought there was too much inconsistency in this technology	1	2	3	4	5
7	I would imagine that most people would learn to use this technology very quickly	1	2	3	4	5
8	I found this technology very cumbersome (awkward) to use	1	2	3	4	5
9	I felt very confident using this technology	1	2	3	4	5
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		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
1	I think that I would like to use this technology frequently	1	2	3	4	5
2	I found this technology unnecessarily complex	1	2	3	4	5
3	I thought this technology was easy to use	1	2	3	4	5
4	I think that I would need the support of a technical person to be able to use this technology	1	2	3	4	5
5	I found the various functions in this technology were well integrated	1	2	3	4	5

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6	I thought there was too much inconsistency in this technology	1	2	3	4	5
7	I would imagine that most people would learn to use this technology very quickly	1	2	3	4	5
8	I found this technology very cumbersome (awkward) to use	1	2	3	4	5
9	I felt very confident using this technology	1	2	3	4	5
10	I needed to learn a lot of things before I could get going with this technology	1	2	3	4	5

Thank you for your time & feedback!

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

3) Pilot 1 UC003 final interview participants

Digital solutions:

- SHAPES App in general / Tablet
- Videocall solution

Now that you have been able to test the individual applications of pilot 1 UC001 in your own home environment, we would like you to answer a few more questions in summary.

Socio-demographic information:

age: Mid 60, Mid 60, Late 60, Early 70, Early 70

gender: Male, Male, Male, Female, Female

role (care receiver, care giver, researcher): Care Receiver (Participants)

Experience with digital applications:

- ☐ high (daily use of digital applications) *(3 Participants)
- ☐ medium (at least 1x per week) *(2 Participants)
- ☐ low (at least 1x every 2 weeks)
- ☐ none at all (no experience at all)

Marital status:

- ☐ married
- ☐ living together
- ☐ Single (never been married) *(1 Participant)
- ☐ Living separately *(1 Participant)
- ☐ Divorced *(2 Participant)
- ☐ Widowed *(1 Participant)

Education:

- ☐ University degree *(2 Participant)
- ☐ Higher education entrance qualification (general or subject-related) *(2 Participant)
- ☐ Intermediate school leaving certificate *(1 Participant)

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- Secondary school leaving certificate
- Qualified lower secondary school leaving certificate

Do you get help from a family member in daily activities?

- Never *(4 Participant)
- hardly ever *(1 Participant)
- sometimes
- often

A household may have different sources of income and it may be that more than one household member contributes to the income. Think about the total monthly income of your household: Is your household making ends meet?

- Very easy *(4 Participants)
- Easy *(1 Participant)
- Fairly easy
- With some difficulty
- With difficulties
- With great difficulty

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

Perception and understanding

What is SHAPES from your point of view?

Communication app.
A project focused on Older Adults, at EU level.

Were the individual applications understandable for you?

Yes.

Were you able to operate the individual applications?

Yes.

Do you find the visualisation attractive?

Yes, no remark.

What do you like? / What do you enjoy?

Video call.

Why?

It’s fun to talk to relatives/friends that is not in a close approximately.

What do you not like?

None…

Why?

-

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Are you missing anything (e.g. information, a display, a key, a function)?

None…

Interaction / Intuition / Function

Was the handling comprehensible and understandable for you??

Yes.

Were you able to find specific information within the applications?

Yes, mostly without too much training or trouble.

Which functions were understandable?

How to place a call.

...and which not?

None.

Would you like to have reminders and recommendations? How many per day?

No comment.

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Appearance / Layout

In general, how did you like the appearance / layout of the applications?

General good, noting to add.

Were you able to read / recognise all the information?

Yes.

How do you like the colour scheme?

Yes.

Were the contrasts good?

Yes.

Was the presentation well-arranged?

Yes, noting to add…

Did you feel overwhelmed or was it clear and well structured?

It was well structured.

In your opinion, should something be changed in the appearance?

No comment.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

General feedback

What do you think overall about SHAPES, the use case and the applications presented?

It was fun to be a part of a project, and to have concurrent call with relatives.

How do you rate it, how much training and support will you need to use these digital solutions?

Majority (three participants) rated it as low to none training, they could figure out most thing by themselves.
Two participants, rated it as low level of training. Could need some assistance in the beginning.

Which functions / applications / digital solutions are most interesting and useful for you?

The call with focus on video.

Which functions / applications / digital solutions are useless from your point of view? Which applications do you not need and why?

None.

Would you continue to use the tested applications?

Yes.

Do you find it generally useful to develop a specific platform for healthy ageing?

Yes.

If the SHAPES APP and the individual applications were to exist in the future, would you be willing to pay money for them?

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Should it not be free like other devices that exist on tablets?

Under what conditions would you be willing to use the SHAPES app in the future?

If it's free.

Each interview did a separate System Usability Scale (SUS)

		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
1	I think that I would like to use this technology frequently	1	2	3	4	5
2	I found this technology unnecessarily complex	1	2	3	4	5
3	I thought this technology was easy to use	1	2	3	4	5
4	I think that I would need the support of a technical person to be able to use this technology	1	2	3	4	5
5	I found the various functions in this technology were well integrated	1	2	3	4	5
6	I thought there was too much inconsistency in this technology	1	2	3	4	5
7	I would imagine that most people would learn to use this technology very quickly	1	2	3	4	5
8	I found this technology very cumbersome (awkward) to use	1	2	3	4	5
9	I felt very confident using this technology	1	2	3	4	5
10	I needed to learn a lot of things before I could get going with this technology	1	2	3	4	5

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		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
1	I think that I would like to use this technology frequently	1	2	3	4	5
2	I found this technology unnecessarily complex	1	2	3	4	5
3	I thought this technology was easy to use	1	2	3	4	5
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9	I felt very confident using this technology	1	2	3	4	5
10	I needed to learn a lot of things before I could get going with this technology	1	2	3	4	5

	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree

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1	I think that I would like to use this technology frequently	1	2	3	4	5
2	I found this technology unnecessarily complex	1	2	3	4	5
3	I thought this technology was easy to use	1	2	3	4	5
4	I think that I would need the support of a technical person to be able to use this technology	1	2	3	4	5
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8	I found this technology very cumbersome (awkward) to use	1	2	3	4	5
9	I felt very confident using this technology	1	2	3	4	5
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1	I think that I would like to use this technology frequently	1	2	3	4	5
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3	I thought this technology was easy to use	1	2	3	4	5

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4	I think that I would need the support of a technical person to be able to use this technology	1	2	3	4	5
5	I found the various functions in this technology were well integrated	1	2	3	4	5
6	I thought there was too much inconsistency in this technology	1	2	3	4	5
7	I would imagine that most people would learn to use this technology very quickly	1	2	3	4	5
8	I found this technology very cumbersome (awkward) to use	1	2	3	4	5
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		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
1	I think that I would like to use this technology frequently	1	2	3	4	5
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5	I found the various functions in this technology were well integrated	1	2	3	4	5

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6	I thought there was too much inconsistency in this technology	1	2	3	4	5
7	I would imagine that most people would learn to use this technology very quickly	1	2	3	4	5
8	I found this technology very cumbersome (awkward) to use	1	2	3	4	5
9	I felt very confident using this technology	1	2	3	4	5
10	I needed to learn a lot of things before I could get going with this technology	1	2	3	4	5

Thank you for your time & feedback!

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4) Pilot 1 UC003 final interview participants

Digital solutions:

- SHAPES App in general / Tablet
- Videocall solution

Now that you have been able to test the individual applications of pilot 1 UC001 in your own home environment, we would like you to answer a few more questions in summary.

Socio-demographic information:

age: Early 30

gender: Female

role (care receiver, care giver, researcher): Care Giver

Experience with digital applications:

- ☐ **high (daily use of digital applications)**
- ☐ medium (at least 1x per week)
- ☐ low (at least 1x every 2 weeks)
- ☐ none at all (no experience at all)

Marital status:

- ☐ married
- ☐ living together
- ☐ Single (never been married)
- ☐ Living separately
- ☐ Divorced
- ☐ Widowed

Education:

- ☐ **University degree**
- ☐ Higher education entrance qualification (general or subject-related)
- ☐ Intermediate school leaving certificate
- ☐ Secondary school leaving certificate

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- Qualified lower secondary school leaving certificate

Do you get help from a family member in daily activities?

- **never**
- hardly ever
- sometimes
- often

A household may have different sources of income and it may be that more than one household member contributes to the income. Think about the total monthly income of your household: Is your household making ends meet?

- **Very easy**
- Easy
- Fairly easy
- With some difficulty
- With difficulties
- With great difficulty

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Perception and understanding

What is SHAPES from your point of view?

An adaptive platform for means. In this case communication tool or available communication tool.

Were the individual applications understandable for you?

Yes, appropriate menus and easy to understand.

Were you able to operate the individual applications?

Yes.

Do you find the visualisation attractive?

Yes, it was attractive, no major comment. Enough about everything.

What do you like? / What do you enjoy?

Ease of use, and video communication.

Why?

Because of the ease of use.

What do you not like?

The call-address, or SUadress…

Why?

Would be easier if it was like a phone number. Something most people are common with.

Are you missing anything (e.g. information, a display, a key, a function)?

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No.

Interaction / Intuition / Function

Was the handling comprehensible and understandable for you??

Yes.

Were you able to find specific information within the applications?

Yes.

Which functions were understandable?

The call functions.

...and which not?

Would you like to have reminders and recommendations? How many per day?

Don’t know, no comment.

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Appearance / Layout

In general, how did you like the appearance / layout of the applications?

It was good. Great that you can increase size and change contrast. This was very helpful for our participants.

Were you able to read / recognise all the information?

Yes.

How do you like the colour scheme?

Yes.

Were the contrasts good?

Yes.

Was the presentation well-arranged?

Yes.

Did you feel overwhelmed or was it clear and well structured?

It was well structured.

In your opinion, should something be changed in the appearance?

No, nothing I can think of. Maybe it was hard to find settings…

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General feedback

What do you think overall about SHAPES, the use case and the applications presented?

Overall good, municipalities like solution that follows GDPR and is adapted to the legislation.

How do you rate it, how much training and support will you need to use these digital solutions?

None at all.

Which functions / applications / digital solutions are most interesting and useful for you?

The call function with focus on video. The video gave the solution added value.

Which functions / applications / digital solutions are useless from your point of view? Which applications do you not need and why?

None…

Would you continue to use the tested applications?

Yes, absolutely.

Do you find it generally useful to develop a specific platform for healthy ageing?

Yes. Municipalities would find this very interesting.

If the SHAPES APP and the individual applications were to exist in the future, would you be willing to pay money for them?

Yes, I believe so, we in municipalities find this interesting.

A general comment, the older adults are more price sensitive.

Under what conditions would you be willing to use the SHAPES app in the future?

For video call/communication.

System Usability Scale (SUS)

		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
1	I think that I would like to use this technology frequently	1	2	3	4	5
2	I found this technology unnecessarily complex	1	2	3	4	5
3	I thought this technology was easy to use	1	2	3	4	5
4	I think that I would need the support of a technical person to be able to use this technology	1	2	3	4	5
5	I found the various functions in this technology were well integrated	1	2	3	4	5
6	I thought there was too much inconsistency in this technology	1	2	3	4	5
7	I would imagine that most people would learn to use this technology very quickly	1	2	3	4	5
8	I found this technology very cumbersome (awkward) to use	1	2	3	4	5
9	I felt very confident using this technology	1	2	3	4	5
10	I needed to learn a lot of things before I could get going with this technology	1	2	3	4	5

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5) Pilot 1 UC003 final interview participants

Digital solutions:

- SHAPES App in general / Tablet
- Videocall solution

Now that you have been able to test the individual applications of pilot 1 UC001 in your own home environment, we would like you to answer a few more questions in summary.

Socio-demographic information:

age: Early 30

gender: Female

role (care receiver, care giver, researcher): Care Giver

Experience with digital applications:

- ☐ **high (daily use of digital applications)**
- ☐ medium (at least 1x per week)
- ☐ low (at least 1x every 2 weeks)
- ☐ none at all (no experience at all)

Marital status:

- ☐ married
- ☐ living together
- ☐ Single (never been married)
- ☐ Living separately
- ☐ Divorced
- ☐ Widowed

Education:

- ☐ **University degree**
- ☐ Higher education entrance qualification (general or subject-related)
- ☐ Intermediate school leaving certificate
- ☐ Secondary school leaving certificate

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- ☐ Qualified lower secondary school leaving certificate

Do you get help from a family member in daily activities?

- ☐ **never**
- ☐ hardly ever
- ☐ sometimes
- ☐ often

A household may have different sources of income and it may be that more than one household member contributes to the income. Think about the total monthly income of your household: Is your household making ends meet?

- ☐ **Very easy**
- ☐ Easy
- ☐ Fairly easy
- ☐ With some difficulty
- ☐ With difficulties
- ☐ With great difficulty

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

Perception and understanding

What is SHAPES from your point of view?

A Stripped tool for video communication, included in a larger platform.

Were the individual applications understandable for you?

Yes, appropriate menus and easy to understand.

Were you able to operate the individual applications?

Yes.

Do you find the visualisation attractive?

Could be perceived as little dark, otherwise attractive.

What do you like? / What do you enjoy?

Like that it was stripped of unnecessary functions and clear symbols.

Why?

Ease of use.

What do you not like?

None.

Why?

-

Are you missing anything (e.g. information, a display, a key, a function)?

None.

Interaction / Intuition / Function

Was the handling comprehensible and understandable for you??

Yes.

Were you able to find specific information within the applications?

Yes.

Which functions were understandable?

The call function and video.

...and which not?

None.

Would you like to have reminders and recommendations? How many per day?

No comment.

Appearance / Layout

In general, how did you like the appearance / layout of the applications?

It was good, could be little dark. But otherwise great.

Were you able to read / recognise all the information?

Yes.

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How do you like the colour scheme?

Yes.

Were the contrasts good?

Yes.

It was good to see that you could shift to high contrast in quite easy way. This is not always the case on 'free' apps. Which might not have the functionality or could be very hard to do so.

Was the presentation well-arranged?

Yes.

Did you feel overwhelmed or was it clear and well structured?

It was well structured.

In your opinion, should something be changed in the appearance?

The SHAPES front-end (loading page) could change a little maybe.

Was maybe a little unnecessary to log-in and click on the video button for the app to start, understandable because this is scaled off, but since we only had once app, it could start directly when you log in.

General feedback

What do you think overall about SHAPES, the use case and the applications presented?

Clear user-interface. A good use case, which also 'helped' some of our participants.

All participants gave me very positive feedback.

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How do you rate it, how much training and support will you need to use these digital solutions?

I was prepared to step in and help more often. But this was not needed.

Which functions / applications / digital solutions are most interesting and useful for you?

… the call and video …

Which functions / applications / digital solutions are useless from your point of view? Which applications do you not need and why?

…

Would you continue to use the tested applications?

Yes.

Do you find it generally useful to develop a specific platform for healthy ageing?

Yes, I think it's good and something that is missing on today's market.

If the SHAPES APP and the individual applications were to exist in the future, would you be willing to pay money for them?

How much??

Under what conditions would you be willing to use the SHAPES app in the future?

For work.

System Usability Scale (SUS)

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		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
1	I think that I would like to use this technology frequently	1	2	3	4	5
2	I found this technology unnecessarily complex	1	2	3	4	5
3	I thought this technology was easy to use	1	2	3	4	5
4	I think that I would need the support of a technical person to be able to use this technology	1	2	3	4	5
5	I found the various functions in this technology were well integrated	1	2	3	4	5
6	I thought there was too much inconsistency in this technology	1	2	3	4	5
7	I would imagine that most people would learn to use this technology very quickly	1	2	3	4	5
8	I found this technology very cumbersome (awkward) to use	1	2	3	4	5
9	I felt very confident using this technology	1	2	3	4	5
10	I needed to learn a lot of things before I could get going with this technology	1	2	3	4	5

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Annex 48

UC-PT1-004 Data plan

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_48_PT1_UC004_Data-Plan.xlsx

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Annex 49

UC-PT1-004 MOMENTUM

7 List of indicators

For ease of use, this section contains a complete list of the 51 indicators already presented sequentially in Sections 3-6 in the context of each individual critical success factor.

7.1 Context

7.1.1 CSF 1. Ensure that there is cultural readiness for the telemedicine service

- In my organisation/region doctors and other healthcare professionals are ready to share clinical information with each other and with the patient i.e., there is a level of trust among all the stakeholders.

YES. According to interviews in mock-ups, patients of Clinica Humana are willing to share activity data with them.

- In my organisation/region patients and providers (healthcare professionals) are ready to use ICT (e.g., computers, tablets, mobile phones).

YES. Care providers at Clinica Humana already use ICT in their daily work. Patients usually accepts new technologies as far as they have a clear benefit.

- In my organisation/region financial and other incentives are aligned with the service to be deployed.

TO DO. Financial strategy has to be developed.

- In my organisation/region an underpinning culture embraces technology.

YES. Clinica Humana has a flexible operational framework and is aware of the importance of incorporating cost-effective digital solutions. ICT is at the strategic core of the company.

- In my organisation/region an underpinning culture welcomes and even promotes change, innovation and shows openness to new ideas.

YES. Clinica Humana has constant talks with their patients and health workers about the potential benefits of incorporating new ideas/solutions.

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7.1.2 CSF 2. Come to a consensus on the advantages of telemedicine in meeting compelling need(s)

- In my region/organisation there is general consensus on the current telemedicine solution being the best available solution for meeting a compelling need.

YES. Clinica Humana core business is to provide home care, where telemedicine solutions are seen as the technologies which enable the business model. The robot is seen as a tool for constant interaction with the patient, and its social side is an element poorly managed in current services for older people.

- The current telemedicine solution is the best available solution for meeting a compelling need.

NOT SURE. The social robots as companions to alleviate isolation and promote social activities is still a research area, where more data is needed to optimise the type of interaction required for such goals.

7.2 People

7.2.1 CSF 3. Ensure leadership through a champion

- In my region/organisation there is one or several influential person(s) who take(s) on a leading role and leads the way towards deployment of the telemedicine solution tested in our project.

YES. Dra. Karina Ojanguren, CEO of Clinica Humana, has already promoted the internal deployment ICT solutions.

7.2.2 CSF 4. Involve healthcare professionals and decision-makers

- Healthcare professionals have been involved in the development of the content of this project.

YES. Dra. Karina Ojanguren and Dra. Maite Carretero have been involved in the definition of the functionalities. In addition, interviews in phase 2 were carried out with health care staff at sheltered apartments Ca'n Granada.

- Healthcare professionals have been involved in the development of the process and time schedule for this project.

YES. Dra. Karina Ojanguren and Dra. Maite Carretero have been involved.

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- Decision-makers have been involved in the development of the content of this project.

YES. Dra. Karina Ojanguren is CEO of Clínica Humana.

- Decision-makers have been involved in the development of the process and time schedule for this project.

YES. Dra. Karina Ojanguren is CEO of Clínica Humana.

7.2.3 CSF 5. Put the patient at the centre of the service

- In this project[17] the patients have been sufficiently involved in the development of the telemedicine solution.

YES. Older people representative of final users have been involved in mock-up presentations in phase 2. Further sessions, hands-on training and controlled pilot, will be carried out in phase 3 and 4, respectively.

- In this project telemedicine service is based on the patient´s needs.

YES. Objectives is to promote social activity and active healthy ageing. Studies show that seniors who stay socially active and engaged experience a variety of benefits, both in physical and psychological health.

- In this project enough information and training is provided for the patients in order for them to obtain the best results possible from using the telemedicine solution.

TO DO. Tasks to provide proper training are included in the design of phases 3, 4 and 5.

7.2.4 CSF 6. Ensure that the technology is user-friendly

- The telemedicine technology used in our project is user-friendly for patients.

TO DO. It is the objective and great effort is done within the SHAPES consortium to define requirements to fulfil this.

- The telemedicine technology used in our project is user-friendly for health professionals.

NO. User experienced is centred around the older people. Technologies which allow interaction with health professionals are still in a first phase of development and user-friendliness is not considered.

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- The telemedicine technology used in our project does not need an extended training process prior to using it.

YES. Half-day training is expected to be sufficient. A follow up of older people to check their adaptation may be required for 2-3 weeks.

7.3 Plan

7.3.1 CSF 7. Pull together the resources needed for deployment

- In my region/organisation the financial resources needed for deployment of the telemedicine solution are available.

YES. SHAPES and already allocated internal resources are provided (for pilot).

- In my region/organisation the IT competences needed for deployment of the telemedicine solution are available.

YES. For the pilot, one technician provided by Clinica Humana will collaborate with PAL Robotics IT support.

- In my region/organisation enough time for the training needed in order to implement the telemedicine solution is available.

YES. It is included in the SHAPES agreement.

7.3.2 CSF 8. Address the needs of the primary client(s)

- The telemedicine solution addresses the needs of the primary clients.

YES.

Older people/families are potential clients, as a tool for caregivers to promote social activity and as a system that detects some emergency situations (fall, temperature).

Health care providers are potential clients, as a tool to broaden their service by offering social stimulation and as a system that detects some emergency situations (fall, temperature).

Sheltered apartments are potential clients, as a tool that participates in the organisation of daily tasks (shopping list, collecting menu info, …) and as a system that detects some emergency situations (fall, temperature).

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- The telemedicine solution is sufficiently adapted to the needs of the primary users.

YES. Needs were defined based on incorporating medical doctors in the development and interviews with older people, caregivers and health care providers.

- The telemedicine solution addresses the needs of the health sector.

YES, particularly providers of sheltered apartments.

Three example indicators follow (the second indicator is relevant to health care systems where municipalities have a role to play in health care and the third one is specifically relevant to the Norwegian setting).

Indicators for measuring addressing the needs of the health sector

- The telemedicine service addresses the needs for efficiency improvement and improvement of quality in the health sector.

YES. The alert systems, scheduling of activities to promote healthy ageing and the actions oriented to optimise tasks in sheltered apartments (shopping list, menu registration) have been designed to improve efficiency of health care.

- The telemedicine service is adapted to the need for cooperation between municipalities.

NO.

- The telemedicine service is adapted to the need of the health sector for interaction in with the principle of Best Efficient Level of Care.

YES. Particularly oriented to promote social engagement in a healthy ageing lifestyle, a dimension poorly included in health care plans.

[17] The wording of these indicators tends to focus on use of the word project. However, in many telemedicine settings, words such as service or initiative or venture might prove to be more suitable. Alternatively, organisation or region might also be considered.

7.3.3 CSF 9. Prepare and implement a business plan

- A business plan for the project has been developed.

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To do (D7.3 SHAPES Business Plan WP7)

- A business plan for the project has been implemented.

To do after the pilot.

- The business plan has been approved by the relevant management level.

To do after the pilot

7.3.4 CSF 10. Prepare and implement a change management plan

- A change management plan for the project has been developed.

To do after the pilot.

- A change management plan for the project has been implemented.

To do after the pilot.

- A change management plan has been approved by the relevant management level.

To do after the pilot.

7.3.5 CSF 11. Assess the conditions under which the service is legal

- Prior to the start of the project, we assessed the conditions under which the service is legal.

YES. The service is legal under the required CE and AEMPS certifications. We are evaluating with them the permissions for the pilot, but no further certification is expected for the pilot. They will be evaluated after the pilot.

7.3.6 CSF 12. Guarantee that the technology has the potential for scale-up

- We are fully aware of what it takes for the technology to be deployed on a large scale.

To do after pilot. Scaling up of the robot manufacturing is a complex process and needs to be evaluated along with the cost-efficiency analysis.

- In our region/organisation we are ready for large-scale deployment of the technology.

YES. Clinica Humana provides health care to +500 older people. Clinica Humana works with mayor insurances companies in Mallorca.

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- The project will supply the documentation needed to ensure that there is a basis for large-scale deployment of the project.

To do after the pilot.

7.4 Run

7.4.1 CSF 13. Identify and apply relevant legal and security guidelines

- The project is carried out in accordance with the relevant guidelines on legal matters.

YES. We are in contact with Comitè d'Ètica de les Investigacions de les Illes Balears and the Spanish Medicine Agency to follow required approvals to carry out the pilot.

- The project is carried out in accordance with the relevant guidelines on security matters.

YES. GDPR will be applied. The system provided implements all security and privacy related regulations.

7.4.2 CSF 14. Involve legal and security experts

- We have received advice on the project from legal experts.

YES. We worked with LAUREA, with extensive expertise in this field, with VICOMTECH, who was awarded with the ISO 27001 certification for information security management and with HMU who has extensive expertise in IT infrastructure security.

- We have received advice on the project from experts on data security matters.

YES. Clínica Humana worked with SHAPES partners to implement a data management plan, particularly because we dealt with health data.

- In this project we are not experiencing any data security problems.

NO. However a risk assessment regarding data management will be developed and updated to foresee any potential data security problems.

- I have confidence in the legality of this project.

YES. It's a H2020 project with partners with extensive expertise in this field (LAUREA for example).

- I have confidence in the security of this project.

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YES. It's a H2020 project with partners with extensive expertise in this field (HMU and PAL for example).

7.4.3 CSF 15. Ensure that telemedicine doers and users are privacy aware

- In this project the telemedicine doers are aware of protecting the patients´ privacy in terms of health information and other information collected during the course of the pilot.

YES. Health care workers at Clinica Humana and Ca'n Granda already work with data protection protocols. They will be also instructed the application of data protection with the new technologies introduced in the pilot. Older people and informal caregivers will be informed about data collection and process and consents will be collected.

7.4.4 CSF 16. Ensure that the information technology infrastructure and eHealth infrastructure are available

- We have ensured that the IT infrastructures needed are in place for deployment and large-scale implementation.

YES. Large-scale implementation will be evaluated after the pilot. After interviews with older people, using the robot as emergency channel arose as an important new feature. We are evaluating the feasibility of this new functionality.

- We have ensured that the eHealth infrastructures needed are in place for deployment and large-scale implementation.

YES. All parts of the infrastructure are provided by SHAPES partners. After interviews with older people, using the robot as emergency channel arose as an important new feature. We are evaluating the feasibility of this new functionality, as they may need devices external to SHAPES.

7.4.5 CSF 17. Put in place the technology and processes needed to monitor the service

- We have set up a system to monitor our telemedicine service ensure that it is running smoothly at all times.

YES. The system will work 24/365. In case of any bugs or issues the development and maintenance team will fix it. The Team will be composed by technicians at Clinica Humana and PAL. CH, PAL, VICOM, TREE and EDGE are the owners of all the software that is used in the pilot. This means that we don't have any software dependencies with third parties, and that we can fix the source code at any point it's needed quickly. After interviews with older people, using the robot as emergency channel arose as an important new feature. We are evaluating the feasibility of this new functionality, as they may need devices external to SHAPES.

- We have set up a system to solve any incident that may occur during the service.

YES. The system logs all activities so any incident can be identified and solved quickly.

- We have a system which supports the end-users in resolving any doubts that they might experience with the telemedicine solution.

YES. Apart from the user manual, we have access to the software developers of the system so in case of doubts or questions we can answer them directly. Participants will have direct contact with Clinica Humana. Every participant in the pilot has a current relationship with Clinica Humana, patients, professional collaborators (Ca’n Granada) or own staff, assuring a smooth communication.

7.4.6 CSF 18. Establish and maintain good procurement processes

- We have clear agreements regarding the quality of the deliveries provided by our vendors.

All technologies in current version of the technology come from SHAPES partners. After interviews with older people, using the robot as emergency channel arose as an important new feature. We are evaluating the feasibility of this new functionality, as they may need devices external to SHAPES.

- We have clear agreements regarding the service level provided by our vendors.

All technologies in current version of the technology come from SHAPES partners. After interviews with older people, using the robot as emergency channel arose as an important new feature. We are evaluating the feasibility of this new functionality, as they may need devices external to SHAPES.

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Annex 50

NASSS-CAT (SHORT)
IDENTIFYING COMPLEXITIES IN YOUR TECHNOLOGY PROJECT

The questions below help you think about the various complexities of your project and how they all interact. Use your responses and notes as the basis for a team discussion.

Name of your project: PT1-004 Robot to Support Older Adults to Live Independently and Remain Socially Connected

THE ILLNESS OR CONDITION

Think about the illness or other condition that the technology is designed for – and what sort of person has that condition.

	Agree	*Disagree*	*Not applicable or don't know*
There are significant uncertainties about the condition e.g. poorly defined, variable manifestations, uncertain course Older adults' users of the robot may have multiple conditions associated with their age but are independent and can live on their own or with little help. However, some of their limitations, together with the social culture, may lead to social isolation. The factors that lead to social isolation are complex and probably requires a multi-angle approach. The robot's features help on specific aspects and each one has value on its own. However, the final objective of preventing isolation is unclear.	*x*		
Many people with the condition have other co-existing illnesses or impairments that could affect their ability to benefit from this solution Robot allows two modes of interaction (voice and through the tablet) and incorporates several functionalities.		*x*	

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Although some functionalities may be harder to be used for specific impairments, the variety assures benefit for most of users.			
Many people with the condition have social or cultural factors that could affect their ability to benefit from the technology or service Although users would need some training to interact with a technology which is novel for them, the necessary skills are low. Many older adults have assumed their mobility prevents them from doing social/outdoor activities. The robot is not designed to overcome this barrier. The caregivers are responsible of proposing the social events which best fits the older adult to encourage them having a social activity. The robot offers a means to organise these suggestions.		*x*	
The population with the condition, and/or how the condition is treated, is likely to change significantly over the next 3-5 years Older population will increase in the next 5 years (EU-27: rising from 90.5 million at the start of 2019 to reach 129.8 million by 2050*). Every year, the population increases their skills on novel technologies, which favours the introduction of robots as human-interacting devices. * https://bit.ly/3mt88sR Data extracted in July 2020. Info as of Apr 8, 2021		*x*	
SUMMARY: The condition has significant complexity which is likely to affect the project's success Although the general objective to reduce isolation and prolong independent living is uncertain, clear benefit is provided to older people on specific daily tasks.	☐ *Yes*	☒ *No*	

THE TECHNOLOGY

Think about the technology (e.g. a tool or piece of software), and how it might affect care.

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	Agree	*Disagree*	*Not applicable or don't know*
There are significant uncertainties in what the technology is (e.g. it hasn't been fully developed yet) A set of functionalities of the robot have been well defined. Not all of them may be implemented for the pilot period, so they still have to be prioritized. As a technology which offers services to individuals in a social context, the functionalities of the robot have to be diverse to cover a wide range of user's preferences. The robot's set of functionalities is seen as a continuous working process.		*x*	
There are significant uncertainties in where the technology will come from (e.g. supply chain issues, substitutability) All components and related providers are detected. All providers come from the SHAPES consortium. At interviews with older adults in phase 2, the possibility to call the robot in emergency situations while it is not close to the older person emerged as frequent need. If this requirement is eventually included in the development, an external technology may be needed, and it is not yet identified.		*x*	
There are significant uncertainties about the technology's performance and dependability (e.g. bugs, crashing, cutting out) Many modules from different providers have to be connected. Consequently, many bugs and crashing are expected. However, the technology behind the connectivity is standard and are very likely to be resolved if sufficient time is allowed.		*x*	
There are significant uncertainties about the technology's usability and acceptability (e.g. key people don't trust the data it provides) The robot is a big device working in a home environment. Big rooms, proper light and the absence of obstacles makes	*x*		

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its navigation easier. However, this may not be the case in most homes.			
There are significant technical interdependencies Yes. Different technology components will have to work together, but we don't expect that this fact will be an issue. Well defined APIs, and standard and mature technologies will be used to interoperate among them such as web services.	x		
The technology is likely to require major changes to organisational tasks and routines The technology is designed for not requiring changes of routines to any type of user.		x	
The technology (and/or the service model it supports) is likely to change significantly within the next 3-5 years Research in robotics is evolving rapidly due to advances in artificial intelligence (AI), in particular in the context of speech recognition and computer vision. While still now most of robotics is restricted to research laboratories, and they are task-specific, they will become generic and used in a diverse set of applications, and with improved human-robot interaction to gain wider use in a diverse set of real-world environments.	x		
SUMMARY: The technology has significant complexity which is likely to affect the project's success The technology needs to still develop the connectivity within the involved modules. Although it may be time-demanding, the level of difficulty is low.	*Yes* ☐	*No* ☐ *X*	

THE VALUE PROPOSITION

Think about what kind of value the technology might generate for different groups of people. ('Value' can be financial, such as profit, or non-financial, such as control of symptoms)

	Agree	Disagree	Not applicable or don't know

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The commercial value of the technology is uncertain The robot provides benefit to users, but its cost is high. A cost-benefit analysis needs to be extracted from the pilot results.	x		
The value to the intended users (e.g. patients, clinicians) is uncertain No. All features of the robot address a need detected by at least one type of user.		x	
The value to the healthcare system (e.g. from efficacy and cost-effectiveness studies) is uncertain The robot includes specific features addressing the needs of the health care system (temperature, video-calls). However, the cost-effectiveness is not clear due to the high cost of the robot. This will be evaluated during the pilot.	x		
The value to this particular healthcare organisation, given the current situation locally, is uncertain The robot includes specific features addressing the needs of the health care system (temperature, alerts, video-calls). However, the cost-effectiveness is not clear due to the high cost of the robot. This will be evaluated during the pilot.	x		
The technology could generate a negative value (costs are likely to outweigh benefits) for some stakeholders This is highly likely for the health care system due to the cost of the robot and will be evaluated during the pilot in order to design a cost-effective business model.	x		
The value proposition is likely to change significantly over the next 3-5 years Yes. The cost of robots is likely to decrease due to an increase of production and demand. This fact will favour cost-effectiveness factors.		x	
SUMMARY: The value proposition has significant complexity which is likely to affect the project's success	☒ Yes	☐ No	

The value proposition has significant complexity which is likely to affect a future deployment. Cost-effective barrier needs to be addressed in future steps.		

THE INTENDED ADOPTERS

Think about who is intended to use the technology and what changes it will bring for them.

	Agree	*Disagree*	*Not applicable or don't know*
There is uncertainty about whether and how patients/citizens will adopt the technology [if applicable] The robot is not a wide-spread technology and adoption by older people is uncertain. Main issues are: • How the robot integrates within home places (room sizes, obstacles). • People's needs are diverse. A much wider implementation of functionalities is required to reach to a mass audience.	*x*		
There is uncertainty about whether and how front-line staff will adopt the technology The robot has little interaction with the health care staff, and the functionalities which required soared designer to facilitate their work.		*x*	
There is uncertainty about the implications for people who might be indirectly affected by the technology No other people than users are significantly affected by the technology. Only visitors of older people at their living places, but the potential interactions in this scenario have low-intensity and are optional.		*x*	
There will be significant changes to individual users' perceptions of the technology over the next 3-5 years		*x*	

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Robots are expected to be more common as assistants of older adults. This fact will facilitate the adoption. In addition, new older people are more and more used to novel technologies due to their increasing skills with IT devices.			
SUMMARY: The value proposition has significant complexity which is likely to affect the project's success For commercial purposes, the type of homes and the diversity of people's needs may greatly affect a wide implementation of the technology.	☐ *Yes*	☒ *No*	

THE ORGANISATION(S) IMPLEMENTING THE TECHNOLOGY

Some organisations are better at taking up innovations than others. What about yours?

	Agree	*Disagree*	*Not applicable or don't know*
The organisation's capacity to take on technological innovations is limited CH has the necessary infrastructure to incorporate new technological innovations, both in terms of health services (older adults as users) and technological management (team of 2 people).		*X*	
The organisation is not ready for this particular innovation When the cost-effective analysis is positive, the organisation is ready for full deployment.		*X*	
The organisation would find it hard to commission/purchase the innovation Purchase of the innovation would require a financial initial effort, which needs careful evaluation cost-effective analysis.	*X*		

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The work needed to introduce and routinise the innovation has been underestimated and/or inadequately resourced Introduction of the robot requires little resources (only half day training of users is expected and follow up of older adults for 2-3 weeks).		x	
The organisation(s) involved are likely to have significant restructurings or changes in leadership, mission or strategy over the next 3-5 years No big changes are expected at this level in CH in the next 3-5 years.		x	
SUMMARY: There is significant complexity relating to one or more participating organisations which is likely to affect the project's success A big initial investment is expected in a commercial deployment. It does not impede the undertaking of the pilot, as it will be used to have a proper analysis of cost-effectiveness, needed to elaborate the business model.	☐ Yes	☒ No	

THE EXTERNAL CONTEXT FOR INNOVATION

Think about external conditions that could complicate adoption and spread of the innovation.

	Agree	*Disagree*	*Not applicable or don't know*
The political and/or policy climate is adverse Current policies promote remote technologies and the reduction of health costs, particularly those related to an increasing ageing population.		x	
Professional bodies are opposed to the innovation or don't actively support it Sheltered apartments go after reduction of costs and improvement of health care services. Professional associations of health care workers usually welcome new		x	

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technologies if they reduce workload in order to increase the quality of a personalised assistance.			
Patient organisations and lobbying groups are opposed to the innovation or don't actively support it No.		x	
The regulatory context is adverse Major regulatory dilemmas in the field of robotics: how to keep up with technological advances; how to strike a balance between stimulating innovation and the protection of fundamental rights and values; whether to affirm prevalent social norms or nudge social norms in a different direction; and, how to balance effectiveness versus legitimacy in techno-regulation.	x		
The commercial context is adverse Current trends see the value in technologies that reduce human resources in providing new services. However, the cost-effective balance has to be clearly positive.		x	
Opportunities for learning from other (similar) organisations are limited Other solutions in the market that already exist are not broadly market adopted and as such there is limited possibility for learning. However open-source code in the robotics community does facilitate.		x	
Introduction of the technology/innovation could be threatened by external changes that impact on the organisation External factors can be the object of a business strategy, public policy or concerted social action by public interest groups as issues of privacy, security and social impact.		x	
The policy, regulatory and economic context for this innovation is likely to be turbulent over the next 3-5 years The EU Commission's European strategy published on April 2018 emphasised the need to encourage the development of AI applications centred on people's needs in terms of health-related services and long-term care. The strategy builds upon Europe's advantages in terms of		x	

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scientific and industrial development while it seeks to increase investments in AI (both public and private), prepare for disruptive socio-economic changes and support an adequate ethical and legal framework.			
SUMMARY: There is significant complexity relating to the external context which is likely to affect the project's success However, regulatory context needs to be further evaluated for a future commercial deployment.	☐ *Yes*	☒ *No*	

THINGS TO EXPLORE OR DISCUSS: List the key things in each domain that you would like to look up or discuss with other team members or wider stakeholders

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The illness or condition	The technology	The value proposition
Unclear benefit in the long term related to a reduction of isolation and prolongation of an independent living.	Many interdependencies will be developed. Bugs and crashes expected. Resources are allocated but constant check is needed to keep developing times.	The high cost of the robot needs to be carefully evaluated in a cost-effective analysis after the pilot This will probably affect commercial deployment in the near term.

The intended adopters	The organisation	The external context
The type of homes (size of rooms, presence of furniture) may greatly affect a wide implementation of the technology.	A big initial financial investment is needed by the health provider to deploy the technology commercially. This has to be analysed, along with the cost-effective analysis, at the end of	Regulatory context needs to be further evaluated.

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Annex 51

UC-PT1-004 Presentation Mockup Older Adult

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_51_UC-PT1-004-mock-up-OlderAdult.pdf

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Annex 52

UC-PT1-004 Presentation Mockup caregiver

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_52_PT1_UC004_mock-up-Careviver.pdf

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Annex 53

UC-PT1-004 Presentation Mockup Receptionist Managers

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_53_UC-PT1-004_mock-up-Receptionists-Managers.pdf

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Annex 54

UC-PT1-004 Hand-on Training Planning

HANDS-ON TRAINING PT1-004: PLANNING

All scenarios

Feature	Hands-on-training	Technical process	PAL Feedback
ARI will approach the older person to suggest an activity (either with ARI or external activity) / provide information.	Care professional programs a suggestion (reminder?). ARI approaches the older person and tells them the suggestion / information.	ARI starts navigating looking for the older person. ARI tells the older person to set up for recognition. Older person is recognized. ARI tells the suggestion / information. If this is an activity with ARI, offers option to go to the activity page. Acknowledgment of reception if set by care professional. ARI returns to dock station.	-Navigation OK, reminder flow OK -VICOM recogniser ok, ROS wrapper done. Missing front-end/complete Behavior Tree (decision system). Pending some discussion but could be pilot specific -Route type of reminder to activity instead of only TTS
ARI will tell suggestions when asked to do so by the older person	Care professional programs a suggestion Older person approaches ARI to know suggestions.	Older person approaches ARI. “Hello ARI”. Recognition process. ARI enters listening mode (“Qué quieres hacer?”). Older person tells ARI to know suggestions of the day/week. ARI tells suggestions.	• Audio files to train model missing (done by CH) • Model re-trained by VICOM • ARI behavior (LEDs, touch) to react to wake-up (2-3h work)

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			• Adlib chatbot (CH support to train)/ or Google (PAL)/to react to user speech
Remote navigation and camera activation under agreed circumstances.	Care professional starts remote control of ARI.	Remote control of ARI	OK VPN to be set-up so Clinica people can access robots at homes
Video Call older person to someone	Older person calls CH phone	No need to install anything in users' phones. CH will provide the phones with eTouch for hands-on-training Older person approaches ARI. "Hola ARI". Recognition process. ARI enters listening mode ("Qué quieres hacer?"). "Quiero hacer una llamada a XX". Confirmation yes/no. Can ARI call a phone not with eTouch?	-Wake up word same as above -Calling with EcTouch OK -Calling through touchscreen 1 issue with not seeing correct camera output (lower priority. Undefined hours) -Add confirmation of call to touchscreen and ASR (PAL VICOM) -It can only send voice notes no call -PAL todo: robot turns around to offer the tablet

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Video call, someone to older person	CH phone calling ARI	Upon reception of call signal, ARI activates, looks for older person, recognition, “xxx te está llamando, aceptas la llamada? Yes/no” Call initiated after yes selection.	-Right now no call from CH to ARI - Pending of emails behavior but right now not implemented (higher priority to get DS integration)
Exercises	Maybe to discard, it will be too demanding to program arms movement.		OK
Games	As it is now. Puzzle, memory.	Older person approaches ARI. “Hola ARI”. Recognition process. ARI enters listening mode (“Qué quieres hacer?”). Older person tells ARI to play a game. ARI offers games and game starts eventually. If person is not recognized, game can also start in anonymous mode.	-Wake up word, same as above -Option to trigger or not recognition (skip). VICOM.
Temperature	Older person gets temperature measured.	Older person approaches ARI. “Hola ARI”. Recognition process. ARI enters listening	-Wake up word, as indicated above -Missing to link user recognition to touchscreen (PAL)

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		mode (“Qué quieres hacer?”). Older person tells ARI to take temperature. If temperature is high, “quieres que notifique a XXX”, disclaimer should be on. If person is not recognized, game can also start in anonymous mode, no reporting though.	
(Shopping) list	Older person adds/reviews/delete an item to the list	Older person approaches ARI. “Hola ARI”. Recognition process. ARI enters listening mode (“Qué quieres hacer?”). Older person tells ARI to add an item to the shopping list / to see-hear items in the list / to remove items from list.	Not done yet
Messages?			No
Older person wants to do something in a room different from where ARI is docked?			No unless another solution for calling robot

Independent house

Feature	Hands-on-training	Technical process	PAL Feedback
Fall detection	To show fall detection with call alert.	A personnel of CH lays on the floor. ARI starts navigating for fall detection. When detected: "Caída detectada; quieres que llame al contacto de referencia?" And call starts if answers is yes or no answer.	-Fall detection OK for static robot (BT), enough for hands-on? -Missing fall detection with Look for Person (probably TREE support needed to see best robot movements) -Speed up fall detection using Nvidia (KOM has done, PAL to verify, TREE support)
Fall detection	Care professional programs time for fall detection.	Care professional programs time for fall detection.	-Reminder skill missing (VICOM). Alternatively tasks/jobs (PAL) Behavior to do (after all components already mentioned tested)
Status Check	Older person	ARI expects a face recognition at certain times of the day. If this does not happen, an alert call/message/email is sent.	Behavior to do (after all components already mentioned tested)

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		Older person approaches ARI. “Hola ARI”. Recognition. “Qué quieres hacer?” “Nada, solo es el check”.	
Status Check	Care professional programs times to expect face recognition.	Care professional programs times to expect face recognition.	Reminder Skills (VICOM) or PAL tasks/jobs
Come to me	Older person	Older person calls ARI using the WebGUI to come to where it is	WebGUI interface with buttons indicating Kitche, Living Room that activate respective POIs (to evaluate by PAL feasibility)

Ca’n Granada (anywhere)

Feature	Hands-on-training	Technical process
Selection of menu	Older person selects meal menu	Older person approaches ARI. “Hola ARI”. Recognition process. ARI enters listening mode (“Qué quieres hacer?”). Older person tells ARI to go to meal menu selection. Questionnaire with multiple options for each course. Older person confirms selections. ARI sends email with username and results of questionnaire.

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Suggestions for everyone	Older person approaches ARI to know activities at Ca’n Granada.	Older person approaches ARI. “Hola ARI”. Recognition process. ARI enters listening mode (“Qué quieres hacer?”). Older person tells ARI to know activities of the day/week. ARI tells suggestions. If not recognized, options available as anonymous.
Info for everyone	Care professional programs info for all people at Ca’n Granada	Care professional programs info for all people at Ca’n Granada
Info for everyone	Older person approaches ARI to know general info at Ca’n Granada.	Older person approaches ARI. “Hola ARI”. Recognition process. ARI enters listening mode (“Qué quieres hacer?”). Older person tells ARI to know general info of the day/week. ARI tells info. If not recognized, options available as anonymous.

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Annex 55

UC-PT1-004 Hands-on Training Report

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_55_PT1_UC004_Hands-on-training-report.pptx

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Annex 56

UC-PT1-004 Information Sheet Participants

INFORMACIÓN PARA PARTICIPANTES DE SHAPES: Fase 4

Título del estudio: Campaña de proyectos pilotos paneuropeos en el proyecto SHAPES: participación del usuario y opinión de las soluciones digitales del piloto 1 (Entorno de vida inteligente para un envejecimiento saludable en el hogar), caso de uso 4 (Robots para ayudar a las personas mayores a vivir de forma independiente y permanecer conectadas socialmente)

Nos gustaría invitarle a participar en nuestro estudio, durante el cuál apreciaríamos conocer sus opiniones y comentarios sobre las funcionalidades y el diseño de soluciones digitales que están siendo desarrolladas para ayudar a personas mayores tener un envejecimiento activo con ayuda de un robot asistente en el hogar. En concreto, nos gustaría conocer sus opiniones sobre aspectos técnicos, de funcionamiento y usabilidad en un escenario real.

En este estudio pretendemos incluir al menos a 2 personas dentro del equipo de Clínica Humana.

Usted ha sido identificado como una persona con el perfil adecuado para nuestro estudio, por lo que le hacemos llegar esta hoja informativa para leer y considerar si le gustaría participar.

Esta hoja informativa describe el estudio y su papel en este. Antes de que se decida en participar, es importante que entienda por qué se realiza el estudio y qué acciones le implican. Por favor, tome el tiempo que considere necesario para leer este documento y discutir cualquier aspecto con las personas que desee. Cualquier aspecto que no entienda, o si simplemente desea más información, por favor pregunte al investigador o cualquiera de las personas de contacto detalladas al final de este documento, que le contactará una vez haya tenido tiempo de leer esta información.

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Naturaleza voluntaria de la participación

La participación en este estudio es totalmente voluntaria. Puede abandonar el estudio en cualquier momento sin dar ninguna explicación y sin que tenga ninguna consecuencia negativa para usted.

Objeto y objetivos del estudio

Este estudio es parte de un proyecto de investigación mayor que tiene como objeto probar diferentes formas de uso de tecnologías que ayuden a las personas en sus hogares mientras envejecen.

El objetivo del estudio en el que usted ha sido invitado a participar es recoger opiniones y comentarios sobre las funcionalidades del robot asistente en el hogar, así como su puesta en marcha, mantenimiento y resolución de incidencias. En concreto, usted ha sido invitado en lo que se refiere a la parte técnica. Sus comentarios y opiniones serán de gran utilidad para hacer las funcionalidades útiles en un entorno real.

La versión final del robot, con todas sus funcionalidades integradas, serán nuevamente compartidas con los usuarios en una ocasiones más:

- Un piloto donde se probará la tecnología en un entorno real.

¿Quién organiza y financia la investigación?

Clinika de Kay SL, con marca Clínica Humana, organiza el estudio. Este es parte de un proyecto de investigación mayor llamado SHAPES (www.shapes2020.eu), que es financiado por el programa de investigación e innovación Horizon 2020 de la Unión Europea bajo el acuerdo de subvención No. 875159.

¿Qué implica su participación?

Si decide participar en este estudio, se le pedirá que tome parte en una entrevista con un gestor del proyecto (empleado de Clinika de Kay) y el miembro de SHAPES que desarrolla el robot (PAL Robotics).

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Toma de consentimiento

- Después de que haya tenido tiempo de leer la información contenida en este documento, puede contactar con cualquiera de los contactos de Clinika de Kay al final de este documento para cualquier aclaración.
- Si quiere participar en el estudio, rellene con su nombre, fecha y firme el consentimiento informado.

Datos recogidos durante este proyecto de investigación

- Los únicos datos personales que se recogerás de usted serán:
    - Su nombre para identificar el consentimiento informado
    - Su correo electrónico para contactar con usted e enviarle información
    - Su dirección postal (opcional) si quiere que le enviemos copias en papel de los documentos
- Todos los documentos generados, se guardarán solamente en un servidor de Clinika de Kay, con acceso protegido con contraseña únicamente a las personas especificadas al final de este documento. El correo electrónico se guardará también en el servidor de correo de Clinika de Kay. Como copias de los documentos, solo existirán las que transfiramos a usted por correo electrónico y las que le proporcionemos en papel, si así nos lo ha solicitado.
- Si usted menciona cualquier dato durante la entrevista que le pudiera identificar, no se registrará en las notas o se registrará de forma anonimizada.
- Los resultados anonimizados pueden ser usados en futuras investigaciones y/o en actividades de comunicación (por ejemplo, como parte de otras investigaciones dentro del proyecto SHAPES, en artículos de revistas, congresos y conferencias).
- Sus datos personales serán destruidos una vez se le haya proporcionado los resultados de este estudio. Si usted tiene cualquier otro tipo de relación con Clinika de Kay, solo se desligarán sus datos personales en lo relacionado an este estudio.
- Puede pedir la destrucción de sus datos personales en cualquier momento.
- Los datos anonimizados se guardarán durante la duración del proyecto SHAPES (actualmente, sin contar con posibles extensiones, hasta octubre de 2023) y durante 5 (cinco) años después de la finalización del proyecto.

Posibles beneficios por participar

No existen beneficios directos a nivel individual por participar en este estudio, más allá del interés personal y la experiencia de participar en un estudio. Sin embargo, el beneficio indirecto de este estudio es que sus opiniones y puntos de vista serán usados para mejorar las funcionalidades del robot en proveer información a personas

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de su perfil profesional, así como la consideración de crear nuevas si así lo expresa. Su aportación también será valiosa para el uso de tecnologías en la ayuda de personas mayores en sus hogares mientras envejecen. Personas de toda Europa se beneficiarán de su participación.

Posibles inconvenientes por participar

No prevemos que usted sufra ningún inconveniente por participar en este estudio.

Hallazgos incidentales

Los hallazgos incidentales son los descubrimientos que se pueden dar en el estudio sin que este haya sido diseñado para estos fines. En el presente estudio de investigación no se esperan encontrar ningún tipo de hallazgos incidentales.

Información de costes y compensación económica

La participación en este estudio no le incurrirá ningún coste. Usted no recibirá ninguna compensación económica por su participación.

Información sobre los resultados del estudio

Los resultados de este estudio pueden ser utilizados en futuras investigaciones y/o en actividades de comunicación (por ejemplo, como parte de otras investigaciones dentro del proyecto SHAPES, en artículos de revistas, congresos y conferencias). Se le enviarán por correo electrónico los resultados del estudio.

Interrupción del estudio

Las personas de Clinika de Kay que intervienen en este estudio pueden interrumpirlo de forma permanente, sin finalizar, en cualquier momento. Sin embargo, actualmente, no existen razones para que este hecho ocurra. Si quiere salir del estudio, puede pedirlo en cualquier momento a cualquiera de los contactos al final del documento. Siempre podremos seguir utilizando sus datos anonimizados.

Más información

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Puede pedir en cualquier momento más información a los contactos del final de este documento

Datos de contacto del personal de Clinika de Kay asociado a este estudio:

...

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Annex 57

UC-PT1-004 Consent form

DECLARACIÓN CONSENTIMIENTO PARA PARTICIPANTES DE SHAPES: Fase 4

Título del estudio: Campaña de proyectos pilotos paneuropeos en el proyecto SHAPES: participación del usuario y opinión de las soluciones digitales del piloto 1 (Entorno de vida inteligente para un envejecimiento saludable en el hogar), caso de uso 4 (Robots para ayudar a las personas mayores a vivir de forma independiente y permanecer conectadas socialmente)

Localización del estudio:

Clinika de Kay / Clínica Humana

Contactos:

...

Declaración del participante

- He sido invitado a participar en el estudio arriba mencionado. El objetivo del estudio es la recopilación de opiniones y comentarios sobre el diseño, las funcionalidades y aspectos técnicos de soluciones digitales, integradas en un robot, que están siendo desarrolladas para ayudar a personas mayores tener un envejecimiento activo con ayuda de un robot asistente en el hogar.

- He leído y entendido la hoja informativa para el participante. La hoja informativa para el participante me ha aportado suficiente información sobre el estudio arriba mencionado, sus objetivos y su ejecución, sobre mis derechos y sobre los posibles beneficios e inconvenientes al participar.

- He tenido la oportunidad de preguntar sobre el estudio y las cuestiones han sido respondidas satisfactoriamente.

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- Se me ha dado suficiente información sobre la recogida, procesamiento, transferencia/divulgación y borrado de mis respuestas durante el estudio. Entiendo que, a excepción de mi nombre, correo electrónico y, mi dirección postal y teléfono no se procesará ningún otro dato personal durante el estudio. Se me ha entregado el documento Política de Privacidad, donde se explica el proceso que se hace de mis datos personales, y la Declaración Nacional sobre Integridad Científica, cuyos principios sigue Clinika de Kay para este estudio.

- Al firmar esta declaración, confirmo que consiento de forma voluntaria participar en este estudio y que también autorizo el procesamiento de mis respuestas para los objetivos descritos en este documento.

- No he sido presionado o coaccionado para participar y he tenido suficiente tiempo para considerar mi participación en el estudio. Entiendo que mi participación es totalmente voluntaria y que soy libre en abandonar mi consentimiento en cualquier momento sin necesidad de aportar ninguna razón, justificación o aclaración.

- También tengo el derecho de pedir que borren todos los datos personales y cualquier dato que permita mi identificación según la ley de protección de datos (Ley Orgánica 3/2018, de Protección de Datos). Por cualquier conflicto que tenga con nosotros en relación a la protección de datos, puede dirigirse a la Agencia Española de Protección de Datos (AEPD), https://www.aepd.es/es.

<u>A rellenar por el participante</u>

Consentimiento participación en el estudio (por favor, complete los campos siguientes para confirmar su consentimiento)

Nombre:	
Fecha:	
Firma:	

<u>A rellenar por el gestor del proyecto SHAPES en Clinika de Kay</u>

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Recepción del consentimiento firmado (por favor, complete los campos siguientes para confirmar la recepción del consentimiento firmado por parte del participante)

Nombre:	
Fecha:	
Firma:	

El original de este documento firmado por el participante será custodiado por Clinika de Kay. La hoja informativa para el participante y una copia de este documento firmado tanto por el participante como por el gestor del proyecto SHAPES en Clinika de Kay serán entregados al participante.

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Annex 58

UC-PT1-004 Phase 4 Internal technical report

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_58_PT1_UC004_Internal-technical-report.pdf

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Annex 59

UC-PT1-004 Consent Form Older Adults Phase 5

CONSENTIMIENTO INFORMADO PARA LA REALIZACIÓN DE PROYECTOS DE INVESTIGACIÓN – Paciente

V1.0 , 4 de abril del 2022

TÍTULO DEL ESTUDIO: Actividades para vivir de forma independiente y permanecer conectadas socialmente ofrecidas a los participantes a través de ARI, un robot social humanoide desarrollado por PAL. Un estudio de viabilidad no aleatorizado en un entorno real para la evaluación de la participación y percepción de utilidad por parte del usuario en el marco del proyecto SHAPES (Smart and Healthy Ageing through People Engaging in Supportive Systems).

CÓDIGO DEL PROMOTOR: UC-PT1-004-CH

PROMOTOR: Clínika de Kay SL

INVESTIGADOR PRINCIPAL:

CENTRO: La Porcíncula

Yo, …………………………………………………...................*(nombre y apellidos)*,

☐ He leído la hoja de información que se me ha entregado.

☐ He podido hacer preguntas sobre el estudio.

☐ He recibido suficiente información sobre el estudio.

☐ He hablado con Esperança Lladó Pascual.

☐ Comprendo que mi participación es voluntaria.

☐ Comprendo que puedo retirarme del estudio:

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- Cuando quiera.
- Sin tener que dar explicaciones.
- Sin que esto repercuta en mis cuidados médicos.

☐ Comprendo que, si decido retirarme del estudio, los resultados obtenidos hasta ese momento podrán seguir siendo utilizados, a no ser que expresamente indique la destrucción de todos mis datos desde el inicio del estudio y siempre que no hayan sido anonimizados.

En el caso de que los resultados de la investigación proporcionen datos que me puedan interesar a mí o a mis familiares: (*indicar una de las casillas*)

☐ Quiero ser informado.

☐ No quiero ser informado, pero acepto que mi médico contacte con mis familiares si dichos resultados les pueden afectar.

☐ Comprendo que tengo los derechos de acceso, rectificación, supresión, oposición, limitación del tratamiento de datos, incluso a trasladar mis datos a un tercero autorizado (portabilidad), de acuerdo con lo dispuesto en la Ley Orgánica 3/2018, de 5 de diciembre, de protección de datos de carácter personal y garantía de los derechos digitales.

☐ Presto libremente mi conformidad para participar en el estudio y doy mi consentimiento para el acceso y utilización de mis datos en las condiciones detalladas en la hoja de información al paciente.

☐ Doy mi consentimiento expreso para el procesamiento de imágenes, videos y voz con fines analíticos en el marco del proyecto SHAPES. Las imágenes y videos serán procesados para el reconocimiento facial y reconocimiento de emociones y la voz será procesada para el procesamiento natural del lenguaje.

Al término de la investigación mis datos podrán ser:

☐ Destruidos

☐ De-identificados en octubre de 2023 y anonimizados (agregación) en octubre de 2028.

Firma del paciente: Firma del investigador:

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

Nombre: Nombre:

Fecha: Fecha:

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Annex 60

CONSENTIMIENTO INFORMADO PARA LA REALIZACIÓN DE PROYECTOS DE INVESTIGACIÓN – Profesional de la salud

V1.0 , 4 de abril del 2022

TÍTULO DEL ESTUDIO: Actividades para vivir de forma independiente y permanecer conectadas socialmente ofrecidas a los participantes a través de ARI, un robot social humanoide desarrollado por PAL. Un estudio de viabilidad no aleatorizado en un entorno real para la evaluación de la participación y percepción de utilidad por parte del usuario en el marco del proyecto SHAPES (Smart and Healthy Ageing through People Engaging in Supportive Systems).

CÓDIGO DEL PROMOTOR: UC-PT1-004-CH

PROMOTOR: Clínika de Kay SL

INVESTIGADOR PRINCIPAL:

CENTRO: La Porcíncula

Yo, ……………………………………………………....................*(nombre y apellidos)*,

☐ He leído la hoja de información que se me ha entregado.

☐ He podido hacer preguntas sobre el estudio.

☐ He recibido suficiente información sobre el estudio.

☐ He hablado con Esperança Lladó Pascual.

☐ Comprendo que mi participación es voluntaria.

☐ Comprendo que puedo retirarme del estudio:

- Cuando quiera.
- Sin tener que dar explicaciones.
- Sin que esto repercuta en mi actividad laboral.

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☐ Comprendo que, si decido retirarme del estudio, los resultados obtenidos hasta ese momento podrán seguir siendo utilizados, a no ser que expresamente indique la destrucción de todos mis datos desde el inicio del estudio y siempre que no hayan sido anonimizados.

☐ Comprendo que tengo los derechos de acceso, rectificación, supresión, oposición, limitación del tratamiento de datos, incluso a trasladar mis datos a un tercero autorizado (portabilidad), de acuerdo con lo dispuesto en la Ley Orgánica 3/2018, de 5 de diciembre, de protección de datos de carácter personal y garantía de los derechos digitales.

☐ Presto libremente mi conformidad para participar en el estudio y doy mi consentimiento para el acceso y utilización de mis datos en las condiciones detalladas en la hoja de información al profesional de la salud.

Doy mi consentimiento expreso para el procesamiento de imágenes, videos y voz con fines analíticos en el marco del proyecto SHAPES. Las imágenes y videos serán procesados para el reconocimiento facial y reconocimiento de emociones y la voz será procesada el procesamiento natural del lenguaje.

Al término de la investigación mis datos podrán ser:

☐ Destruidos

☐ De-identificados en octubre de 2023 y anonimizados (agregación) en octubre de 2028.

Firma del profesional:	Firma del investigador:
Nombre:	Nombre:
Fecha:	Fecha

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

Annex 61

UC-PT1-004 User Manual Phase 5

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_61_PT1_UC004_UserManual_Phase-5.pdf

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Annex 62

UC-PT1-004 Older Adults Phase 5 Baseline

FORMULARIO PARTICIPANTE PERSONA MAYOR

PROYECTO DE INVESTIGACIÓN SHAPES

Índice

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

1. **Cuestionario sociodemográfico:** Conteste las siguientes preguntas.

VARIABLE	RESPUESTA
Edad	
Género	
Educación (años de educación formal)	
Estado civil	1. Casado/a 2. Convivencia 2. Soltero/a (nunca casado/a) 4. Separado/a 5. Divorciado/a 6. Viudo/a
Estado ocupacional (Trabaja usted por dinero?)	1. Empleado 2. Desempleado 3. Jubilado
Es usted un cuidador?	1. No 2. Sí-tiempo parcial 3. Sí-tiempo completo
Recibe ayuda de un miembro de la familia o un amigo en su día a día?	1. Nunca 2. Rara vez 3. A veces 4. A menudo
Recibe ayuda profesional de un cuidador, profesional sanitario o algún otro servicio para las actividades de la vida diaria?	1. Nunca 2. Rara vez 3. A veces 4. A menudo
Residencia actual	1. Casa propia 2. Casa de cuidador 3. Residencia 4. Otro
Vive solo/a?	1. Sí 2. No
Es su barrio...	1. Urbano 2. Suburbano 3. Rural
País de residencia	

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2. Cuestionario de calidad de vida - (WHOQOL)-Bref

Este cuestionario sirve para conocer su opinión acerca de su calidad de vida, su salud, y otras áreas de su vida. **Por favor conteste a todas las preguntas rodeando la respuesta correcta.** Si no está seguro(a) sobre qué respuesta dara a una pregunta, **escoja la que le parezca más apropiada**.

Tenga presente su modo de vivir, expectativas, placeres y preocupaciones. Le pedimos que piense en su vida durante las dos últimas semanas.

		Muy mal	Poco	Lo normal	Bastante bien	Muy bien
1	¿Cómo puntuaría su calidad de vida?	1	2	3	4	5

		Muy insatisfecho/a	Insatisfecho/a	Lo normal	Bastante satisfecho/a	Muy satisfecho/a
2	¿Cuán satisfecho/a está con su salud?	1	2	3	4	5

Las siguientes preguntas hacen referencia a **cuánto** ha experimentado ciertos hechos en las dos últimas semanas:

		Nada	Un poco	Lo normal	Bastante	Extremadamente
3	¿ En qué medida piensa que el dolor (físico) le impide hacer lo que necesita?	1	2	3	4	5
4	¿Cuánto necesita de cualquier tratamiento médico para funcionar en su vida diaria?	1	2	3	4	5
5	¿Cuánto disfruta de la vida?	1	2	3	4	5
6	¿En qué medida siente que su vida tiene sentido?	1	2	3	4	5

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7	¿Cuál es su capacidad de concentración?	1	2	3	4	5
8	¿Cuánta seguridad siente en su vida diaria?	1	2	3	4	5
9	¿Cuán saludable es el ambiente físico de su alrededor?	1	2	3	4	5

Las siguientes preguntas hacen referencia a **cuán totalmente** usted experimenta o fue capaz de hacer ciertascosas en las dos últimas semanas.

		Nada	Un poco	Mode rado	Basta nte	Totalm ente
10	¿Tiene energía suficiente para la vida diaria?	1	2	3	4	5
11	¿Es capaz de aceptar su apariencia física?	1	2	3	4	5
12	¿Tiene suficiente dinero para cubrir sus necesidades?	1	2	3	4	5
13	¿Qué disponible tiene la información que necesita en su vida diaria?	1	2	3	4	5
14	¿Hasta qué punto tiene oportunidad para realizar actividades de ocio?	1	2	3	4	5
15	¿Es capaz de desplazarse de un lugar a otro?	1	2	3	4	5

Las siguientes preguntas hacen referencia a cuán **satisfecho(a) o bien** se ha sentido en varios aspectos de su vida en las dos últimas semanas.

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		Muy Insatisfecho/a	Insatisfecho/a	Lo normal	Bastante satisfecho/a	Muy satisfecho/a
16	¿Cuán satisfecho/a está con su sueño?	1	2	3	4	5
17	¿Cuán satisfecho/a está con su habilidad para realizar sus actividades de la vida diaria?	1	2	3	4	5
18	¿Cuán satisfecho/a está con su capacidad de trabajo?	1	2	3	4	5
19	¿Cuán satisfecho/a está de sí mismo?	1	2	3	4	5
20	¿Cuán satisfecho/a está con sus relaciones personales?	1	2	3	4	5
21	¿Cuán satisfecho/a está con su vida privada?	1	2	3	4	5
22	¿Cuán satisfecho/a está con el apoyo que obtiene de sus amigos?	1	2	3	4	5
23	¿Cuán satisfecho/a está de las condiciones del lugar donde vive?	1	2	3	4	5
24	¿Cuán satisfecho/a está con el acceso que tiene a los servicios sanitarios?	1	2	3	4	5
25	¿Cuán satisfecho/a está con su transporte?	1	2	3	4	5

La siguiente pregunta hace referencia a la **frecuencia** con que usted ha sentido o experimentado ciertos hechosen las dos últimas semanas.

		Nunca	**Raramente**	**Medianamente**	**Frecuentemente**	**Siempre**

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26	¿Con qué frecuencia tiene sentimientosnegativos, tales como tristeza, desesperanza, ansiedad, depresión?	1	2	3	4	5

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3. Cuestionario de Salud EQ-5D-5L: Debajo de cada enunciado, marque UNA casilla, la que mejor describe su salud HOY.

MOVILIDAD	
No tengo problemas para caminar	
Tengo problemas leves para caminar	
Tengo problemas moderados para caminar	
Tengo problemas graves para caminar	
No puedo caminar	
AUTO-CUIDADO	
No tengo problemas para lavarme o vestirme	
Tengo problemas leves para lavarme o vestirme	
Tengo problemas moderados para lavarme o vestirme	
Tengo problemas graves para lavarme o vestirme	
No puedo lavarme o vestirme	
ACTIVIDADES COTIDIANAS ***(Ej.: trabajar, estudiar, hacer las tareas domésticas, actividades familiares o actividades durante el tiempo libre)***	
No tengo problemas para realizar mis actividades cotidianas	
Tengo problemas leves para realizar mis actividades cotidianas	
Tengo problemas moderados para realizar mis actividades cotidianas	
Tengo problemas graves para realizar mis actividades cotidianas	
No puedo realizar mis actividades cotidianas	
DOLOR / MALESTAR	
No tengo dolor ni malestar	
Tengo dolor o malestar leve	

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Tengo dolor o malestar moderado	
Tengo dolor o malestar fuerte	
Tengo dolor o malestar extremo	
ANSIEDAD / DEPRESIÓN	
No estoy ansioso ni deprimido	
Estoy levemente ansioso o deprimido	
Estoy moderadamente ansioso o deprimido	
Estoy muy ansioso o deprimido	
Estoy extremadamente ansioso o deprimido	

¿Cuál cree que es su salud a día de hoy en una escala de 0 a 100? Respuesta: ---------

100 representa la mejor salud que usted se pueda imaginar y 0 representa la peor salud que usted se pueda imaginar.

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4. Escala de autoeficiencia - GSES: Conteste a las siguientes preguntas siguiendo el formato de respuesta detallado:

Formato de respuesta

1 = incorrecto	2 = apenas cierto	3 = más bien cierto	4 = cierto

Nº Pregunta	Pregunta	Respuesta
1	Puedo encontrar la manera de obtener lo que quiero aunque alguien se me oponga.	
2	Puedo resolver problemas difíciles si me esfuerzo lo suficiente.	
3	Me es fácil persistir en lo que me he propuesto hasta llegar a alcanzar mis metas.	
4	Tengo confianza en que podría manejar eficazmente acontecimientos inesperados.	
5	Gracias a mis cualidades y recursos puedo superar situaciones imprevistas.	
6	Cuando me encuentro en dificultades puedo permanecer tranquilo/a porque cuento con las habilidades necesarias para manejar situaciones difíciles.	
7	Venga lo que venga, por lo general soy capaz de manejarlo.	
8	Puedo resolver la mayoría de los problemas si me esfuerzo lo necesario.	
9	Si me encuentro en una situación difícil, generalmente se me ocurre qué debo hacer.	
10	Al tener que hacer frente a un problema, generalmente se me ocurren varias alternativas de cómo resolverlo.	

5.Escala de Oslo de apoyo social - OSSS-3: Conteste a las siguientes preguntas indicando una de las posibles respuestas.

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1. **¿Con cuántas personas te sientes suficientemente cercano/a como para contra con ellas si tienes problemas graves?**
    a. Con ninguna
    b. Con 1 ó 2
    c. Con 3 – 5
    d. Con 6 o más
2. **¿Cuánta preocupación muestra la gente que conoces sobre lo que haces?**
    a. Mucha preocupación e interés
    b. Algo de preocupación e interés
    c. Incierto
    d. Poca preocupación e interés
    e. Nada de preocupación o interés
3. **¿Con qué facilidad puede obtener ayuda práctica de los vecinos si lo necesita?**
    a. Muy fácilmente
    b. Fácilmente
    c. Posiblemente
    d. Difícilmente
    e. Muy difícilmente
4.
    a. **¿Ha experimentado alguno de los siguientes sucesos en los últimos 6 meses/desde la última vez que hablamos? Por favor, seleccione todas las opciones que correspondan.**
        - Enfermedad grave o daño a uno mismo
        - Enfermedad grave o daño a un pariente cercano
        - Muerte de un familiar de primer grado, incluyendo hijo o cónyuge
        - Muerte de un amigo/a cercano a la familia o de un familiar de segundo grado
        - Separación a causa de problemas conyugales
        - Ruptura de una relación estable
        - Problemas graves con un amigo, vecino o pariente cercano
        - Desempleado/buscando trabajo durante más de un mes
        - Despedido del trabajo
        - Crisis financiera grave
        - Problemas con la policia y comparecencia en un juzgado
        - Pérdida o robo de algo valioso

    b. **Si ha experimentado uno o más de estos sucesos en los últimos 6 meses/desde la última vez que hablamos, responda por favor a las siguientes preguntas:**
        i. ¿Recibió ayuda emocional de alguien en relación con el suceso? Si ha tenido más de un suceso, por favor piense en el más grave.
            - Sí, mucha ayuda

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- Sí, algo de ayuda
- Ninguna ayuda

ii. ¿De quién obtuvo el apoyo emocional? Puede seleccionar más de una opción:

- Cónyuge/Pareja
- Padre/Madre
- Hermano/Hermana
- Hijos/Hijas
- Amigo/Amiga
- Vecino/Vecina
- Otros parientes
- Otros

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6.Escala de conocimiento de salud

¿Cómo se siente de seguro/a al rellenar formularios médicos por sí mismo?

- Extremadamente seguro/a
- Bastante seguro/a
- Algo seguro/a
- Un poco seguro
- Nada seguro

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CUESTIONARIOS ESPECÍFICOS PT1-004

7.Gijón - Escala de valoración socio familiar

A. Situación familiar	
Vive con familia sin dependencia físico/psíquica	**1**
Vive con cónyuge de similar edad	**2**
Vive con familia y/o cónyuge y presenta algún grado de dependencia	**3**
Vive solo y tiene hijos próximos	**4**
Vive solo y carece de hijos o viven alejados	**5**
B. Situación económica	
Más de 1.5 veces el salario mínimo	**1**
Desde 1.5 veces el salario mínimo hasta el salario mínimo exclusive	**2**
Desde el salario mínimo a pensión mínima contributiva	**3**
LISMI – FAS – Pensión no contributiva	**4**
Sin ingresos o inferiores al apartado anterior	**5**
C. Vivienda	
Adecuada a necesidades	**1**
Barreras arquitectónicas en la vivienda o portal de la casa (peldaños, puertas estrechas, baños...)	**2**
Humedades, mala higiene, equipamiento inadecuado (sin baño completo, agua caliente, calefacción...)	**3**
Ausencia de ascensor, teléfono	**4**
Vivienda inadecuada (chabolas, vivienda declarada en ruina, ausencia de equipamientos mínimos)	**5**
D. Relaciones sociales	
Relaciones sociales	**1**
Relación social sólo con familia y vecinos	**2**
Relación social sólo con familia o vecinos	**3**

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No sale del domicilio, recibe visitas	**4**
No sale y no recibe visitas	**5**
E. Apoyo de la red social	
Con apoyo familiar y vecinal	**1**
Voluntariado social, ayuda domiciliaria	**2**
No tiene apoyo	**3**
Pendiente del ingreso en residencia geriátrica	**4**
Tiene cuidados permanentes	**5**
PUNTUACIÓN TOTAL	

8.UCLA - Escala de soledad: Indique con qué frecuencia cada una de las declaraciones a continuación lo describe a usted.

	A menudo	A veces	Rara vez	Nunca
1.- Sintonizo (me llevo bien) con la gente que me rodea				
2.- Me falta compañía				
3.- No tengo a nadie con quien yo pueda contar				
4.- Me siento solo/a				
5.- Me siento parte de un grupo de amigos/as				
6.- Tengo muchas cosas en común con la gente que me rodea				
7.- No tengo confianza con nadie				
8.- Mis intereses e ideas no son compartidos por las personas que me rodean				
9.- Soy una persona abierta (extrovertida)				

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10.- Me siento cercano/a de algunas personas				
11.- Me siento excluido/a, olvidado/a por los demás				
12.- Mis relaciones sociales son superficiales				
13.- Pienso que realmente nadie me conoce bien				
14.- Me siento aislado/a de los demás				
15.- Puedo encontrar compañía cuando lo necesito				
16.- Hay personas que realmente me comprenden				
17.- Me siento infeliz de estar tan aislado/a				
18.- La gente está a mi alrededor pero no siento que esté conmigo				
19.- Hay personas con las que puedo charlar y comunicarme				
20.- Hay personas a las que puedo recurrir				

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9.Escala de experiencias positivas y negativas SPANE

Piense en lo que ha estado haciendo y experimentando durante las últimas cuatro semanas. Luego informe cuánto experimentó cada uno de los siguientes sentimientos, utilizando la escala a continuación. Para cada elemento, seleccione un número del 1 al 5 e indique ese número en su hoja de respuestas.

1. Muy rara vez o nunca
2. Rara vez
3. A veces
4. A menudo
5. Muy a menudo o siempre

- **Positivo**

- **Negativo**

- **Bueno**

- **Malo**

- **Agradable**

- **Desagradable**

- **Feliz**

- **Triste**

- **Miedo**

- **Alegre**

- **Enojado**

- **Satisfecho**

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CUESTIONARIOS ESPECÍFICOS PT1-004

7.Gijón - Escala de valoración socio familiar

A. Situación familiar	
Vive con familia sin dependencia físico/psíquica	**1**
Vive con cónyuge de similar edad	**2**
Vive con familia y/o cónyuge y presenta algún grado de dependencia	**3**
Vive solo y tiene hijos próximos	**4**
Vive solo y carece de hijos o viven alejados	**5**
B. Situación económica	
Más de 1.5 veces el salario mínimo	**1**
Desde 1.5 veces el salario mínimo hasta el salario mínimo exclusive	**2**
Desde el salario mínimo a pensión mínima contributiva	**3**
LISMI – FAS – Pensión no contributiva	**4**
Sin ingresos o inferiores al apartado anterior	**5**
C. Vivienda	
Adecuada a necesidades	**1**
Barreras arquitectónicas en la vivienda o portal de la casa (peldaños, puertas estrechas, baños...)	**2**
Humedades, mala higiene, equipamiento inadecuado (sin baño completo, agua caliente, calefacción...)	**3**
Ausencia de ascensor, teléfono	**4**
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D. Relaciones sociales	
Relaciones sociales	**1**
Relación social sólo con familia y vecinos	**2**
Relación social sólo con familia o vecinos	**3**

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No sale del domicilio, recibe visitas	**4**
No sale y no recibe visitas	**5**
E. Apoyo de la red social	
Con apoyo familiar y vecinal	**1**
Voluntariado social, ayuda domiciliaria	**2**
No tiene apoyo	**3**
Pendiente del ingreso en residencia geriátrica	**4**
Tiene cuidados permanentes	**5**
PUNTUACIÓN TOTAL	

8.UCLA - Escala de soledad: Indique con qué frecuencia cada una de las declaraciones a continuación lo describe a usted.

	A menudo	A veces	Rara vez	Nunca
1.- Sintonizo (me llevo bien) con la gente que me rodea				
2.- Me falta compañía				
3.- No tengo a nadie con quien yo pueda contar				
4.- Me siento solo/a				
5.- Me siento parte de un grupo de amigos/as				
6.- Tengo muchas cosas en común con la gente que me rodea				
7.- No tengo confianza con nadie				
8.- Mis intereses e ideas no son compartidos por las personas que me rodean				
9.- Soy una persona abierta (extrovertida)				

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10.- Me siento cercano/a de algunas personas				
11.- Me siento excluido/a, olvidado/a por los demás				
12.- Mis relaciones sociales son superficiales				
13.- Pienso que realmente nadie me conoce bien				
14.- Me siento aislado/a de los demás				
15.- Puedo encontrar compañía cuando lo necesito				
16.- Hay personas que realmente me comprenden				
17.- Me siento infeliz de estar tan aislado/a				
18.- La gente está a mi alrededor pero no siento que esté conmigo				
19.- Hay personas con las que puedo charlar y comunicarme				
20.- Hay personas a las que puedo recurrir				

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Piense en lo que ha estado haciendo y experimentando durante las últimas cuatro semanas. Luego informe cuánto experimentó cada uno de los siguientes sentimientos, utilizando la escala a continuación. Para cada elemento, seleccione un número del 1 al 5 e indique ese número en su hoja de respuestas.

Muy rara vez o nunca

Rara vez

A veces

A menudo

Muy a menudo o siempre

- **Positivo**

- **Negativo**

- **Bueno**

- **Malo**

- **Agradable**

- **Desagradable**

- **Feliz**

- **Triste**

- **Miedo**

- **Alegre**

- **Enojado**

- **Satisfecho**

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Annex 63

UC-PT1-004 Older Adults End of Pilot

FORMULARIO PARTICIPANTE

PROYECTO DE INVESTIGACIÓN SHAPES

Índice

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3. **Cuestionario sociodemográfico:** Conteste las siguientes preguntas.

VARIABLE	RESPUESTA
Edad	
Género	
Educación (años de educación formal)	
Estado civil	Casado/a 2. Convivencia Soltero/a (nunca casado/a) 4. Separado/a 5. Divorciado/a 6. Viudo/a
Estado ocupacional (Trabaja usted por dinero?)	Empleado 2. Desempleado 3. Jubilado
Es usted un cuidador?	No 2. Sí-tiempo parcial 3. Sí-tiempo completo
Recibe ayuda de un miembro de la familia o un amigo en su día a día?	Nunca 2. Rara vez 3. A veces 4. A menudo
Recibe ayuda profesional de un cuidador, profesional sanitario o algún otro servicio para las actividades de la vida diaria?	Nunca 2. Rara vez 3. A veces 4. A menudo
Residencia actual	Casa propia 2. Casa de cuidador 3. Residencia 4. Otro
Vive solo/a?	Sí 2. No
Es su barrio...	Urbano 2. Suburbano 3. Rural

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País de residencia	

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4. Cuestionario de calidad de vida - (WHOQOL)-Bref

Este cuestionario sirve para conocer su opinión acerca de su calidad de vida, su salud, y otras áreas de su vida. **Por favor conteste a todas las preguntas rodeando la respuesta correcta.** Si no está seguro(a) sobre qué respuesta dara a una pregunta, **escoja la que le parezca más apropiada**.

Tenga presente su modo de vivir, expectativas, placeres y preocupaciones. Le pedimos que piense en su vida durante las dos últimas semanas.

		Muy mal	Poco	Lo normal	Bastante bien	Muy bien
1	¿Cómo puntuaría su calidad de vida?	1	2	3	4	5

		Muy insatisfecho/a	Insatisfecho/a	Lo normal	Bastante satisfecho/a	Muy satisfecho/a
2	¿Cuán satisfecho/a está con su salud?	1	2	3	4	5

Las siguientes preguntas hacen referencia a **cuánto** ha experimentado ciertos hechos en las dos últimas semanas:

		Nada	Un poco	Lo normal	Bastante	Extremadamente
3	¿ En qué medida piensa que el dolor (físico) le impide hacer lo que necesita?	1	2	3	4	5
4	¿Cuánto necesita de cualquier tratamiento médico para funcionar en su vida diaria?	1	2	3	4	5
5	¿Cuánto disfruta de la vida?	1	2	3	4	5
6	¿En qué medida siente que su vida tiene sentido?	1	2	3	4	5

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7	¿Cuál es su capacidad de concentración?	1	2	3	4	5
8	¿Cuánta seguridad siente en su vida diaria?	1	2	3	4	5
9	¿Cuán saludable es el ambiente físico de su alrededor?	1	2	3	4	5

Las siguientes preguntas hacen referencia a **cuán totalmente** usted experimenta o fue capaz de hacer ciertascosas en las dos últimas semanas.

		Nada	Un poco	Moderado	Bastante	Totalmente
10	¿Tiene energía suficiente para la vida diaria?	1	2	3	4	5
11	¿Es capaz de aceptar su apariencia física?	1	2	3	4	5
12	¿Tiene suficiente dinero para cubrir sus necesidades?	1	2	3	4	5
13	¿Qué disponible tiene la información que necesita en su vida diaria?	1	2	3	4	5
14	¿Hasta qué punto tiene oportunidad para realizar actividades de ocio?	1	2	3	4	5
15	¿Es capaz de desplazarse de un lugar a otro?	1	2	3	4	5

Las siguientes preguntas hacen referencia a cuán **satisfecho(a) o bien** se ha sentido en varios aspectos de su vida en las dos últimas semanas.

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		Muy Insatisfecho/a	Insatisfecho/a	Lo normal	Bastante satisfecho/a	Muy satisfecho/a
16	¿Cuán satisfecho/a está con su sueño?	1	2	3	4	5
17	¿Cuán satisfecho/a está con su habilidad para realizar sus actividades de la vida diaria?	1	2	3	4	5
18	¿Cuán satisfecho/a está con su capacidad de trabajo?	1	2	3	4	5
19	¿Cuán satisfecho/a está de sí mismo?	1	2	3	4	5
20	¿Cuán satisfecho/a está con sus relaciones personales?	1	2	3	4	5
21	¿Cuán satisfecho/a está con su vida privada?	1	2	3	4	5
22	¿Cuán satisfecho/a está con el apoyo que obtiene de sus amigos?	1	2	3	4	5
23	¿Cuán satisfecho/a está de las condiciones del lugar donde vive?	1	2	3	4	5
24	¿Cuán satisfecho/a está con el acceso que tiene a los servicios sanitarios?	1	2	3	4	5
25	¿Cuán satisfecho/a está con su transporte?	1	2	3	4	5

La siguiente pregunta hace referencia a la **frecuencia** con que usted ha sentido o experimentado ciertos hechosen las dos últimas semanas.

		Nunca	Raramente	Medianamente	Frecuentemente	Siempre
26	¿Con qué frecuencia tiene sentimientosnegativos, tales como tristeza, desesperanza, ansiedad, depresión?	1	2	3	4	5

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3. Cuestionario de Salud EQ-5D-5L: Debajo de cada enunciado, marque UNA casilla, la que mejor describe su salud HOY.

MOVILIDAD	
No tengo problemas para caminar	
Tengo problemas leves para caminar	
Tengo problemas moderados para caminar	
Tengo problemas graves para caminar	
No puedo caminar	
AUTO-CUIDADO	
No tengo problemas para lavarme o vestirme	
Tengo problemas leves para lavarme o vestirme	
Tengo problemas moderados para lavarme o vestirme	
Tengo problemas graves para lavarme o vestirme	
No puedo lavarme o vestirme	
ACTIVIDADES COTIDIANAS ***(Ej.: trabajar, estudiar, hacer las tareas domésticas, actividades familiares o actividades durante el tiempo libre)***	
No tengo problemas para realizar mis actividades cotidianas	
Tengo problemas leves para realizar mis actividades cotidianas	
Tengo problemas moderados para realizar mis actividades cotidianas	
Tengo problemas graves para realizar mis actividades cotidianas	
No puedo realizar mis actividades cotidianas	
DOLOR / MALESTAR	
No tengo dolor ni malestar	
Tengo dolor o malestar leve	

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Tengo dolor o malestar moderado	
Tengo dolor o malestar fuerte	
Tengo dolor o malestar extremo	
ANSIEDAD / DEPRESIÓN	
No estoy ansioso ni deprimido	
Estoy levemente ansioso o deprimido	
Estoy moderadamente ansioso o deprimido	
Estoy muy ansioso o deprimido	
Estoy extremadamente ansioso o deprimido	

¿Cuál cree que es su salud a día de hoy en una escala de 0 a 100? Respuesta: ---------

100 representa la mejor salud que usted se pueda imaginar y 0 representa la peor salud que usted se pueda imaginar.

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4. Escala de autoeficiencia - GSES: Conteste a las siguientes preguntas siguiendo el formato de respuesta detallado:

Formato de respuesta

1 = incorrecto	2 = apenas cierto	3 = más bien cierto	4 = cierto

Nº Pregunta	Pregunta	Respuesta
1	Puedo encontrar la manera de obtener lo que quiero aunque alguien se me oponga.	
2	Puedo resolver problemas difíciles si me esfuerzo lo suficiente.	
3	Me es fácil persistir en lo que me he propuesto hasta llegar a alcanzar mis metas.	
4	Tengo confianza en que podría manejar eficazmente acontecimientos inesperados.	
5	Gracias a mis cualidades y recursos puedo superar situaciones imprevistas.	
6	Cuando me encuentro en dificultades puedo permanecer tranquilo/a porque cuento con las habilidades necesarias para manejar situaciones difíciles.	
7	Venga lo que venga, por lo general soy capaz de manejarlo.	
8	Puedo resolver la mayoría de los problemas si me esfuerzo lo necesario.	
9	Si me encuentro en una situación difícil, generalmente se me ocurre qué debo hacer.	
10	Al tener que hacer frente a un problema, generalmente se me ocurren varias alternativas de cómo resolverlo.	

5.Escala de Oslo de apoyo social - OSSS-3: Conteste a las siguientes preguntas indicando una de las posibles respuestas.

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5. **¿Con cuántas personas te sientes suficientemente cercano/a como para contra con ellas si tienes problemas graves?**
    a. Con ninguna
    b. Con 1 ó 2
    c. Con 3 – 5
    d. Con 6 o más
6. **¿Cuánta preocupación muestra la gente que conoces sobre lo que haces?**
    a. Mucha preocupación e interés
    b. Algo de preocupación e interés
    c. Incierto
    d. Poca preocupación e interés
    e. Nada de preocupación o interés
7. **¿Con qué facilidad puede obtener ayuda práctica de los vecinos si lo necesita?**
    a. Muy fácilmente
    b. Fácilmente
    c. Posiblemente
    d. Difícilmente
    e. Muy difícilmente
8.
    a. **¿Ha experimentado alguno de los siguientes sucesos en los últimos 6 meses/desde la última vez que hablamos? Por favor, seleccione todas las opciones que correspondan.**
        - Enfermedad grave o daño a uno mismo
        - Enfermedad grave o daño a un pariente cercano
        - Muerte de un familiar de primer grado, incluyendo hijo o cónyuge
        - Muerte de un amigo/a cercano a la familia o de un familiar de segundo grado
        - Separación a causa de problemas conyugales
        - Ruptura de una relación estable
        - Problemas graves con un amigo, vecino o pariente cercano
        - Desempleado/buscando trabajo durante más de un mes
        - Despedido del trabajo
        - Crisis financiera grave
        - Problemas con la policia y comparecencia en un juzgado
        - Pérdida o robo de algo valioso

    c. **Si ha experimentado uno o más de estos sucesos en los últimos 6 meses/desde la última vez que hablamos, responda por favor a las siguientes preguntas:**
        i. ¿Recibió ayuda emocional de alguien en relación con el suceso? Si ha tenido más de un suceso, por favor piense en el más grave.
            - Sí, mucha ayuda

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- Sí, algo de ayuda
- Ninguna ayuda

iii. ¿De quién obtuvo el apoyo emocional? Puede seleccionar más de una opción:

- Cónyuge/Pareja
- Padre/Madre
- Hermano/Hermana
- Hijos/Hijas
- Amigo/Amiga
- Vecino/Vecina
- Otros parientes
- Otros

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6.Escala de conocimiento de salud

¿Cómo se siente de seguro/a al rellenar formularios médicos por sí mismo?

- Extremadamente seguro/a
- Bastante seguro/a
- Algo seguro/a
- Un poco seguro
- Nada seguro

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CUESTIONARIOS ESPECÍFICOS PT1-004

7.Gijón - Escala de valoración socio familiar

A. Situación familiar	
Vive con familia sin dependencia físico/psíquica	**1**
Vive con cónyuge de similar edad	**2**
Vive con familia y/o cónyuge y presenta algún grado de dependencia	**3**
Vive solo y tiene hijos próximos	**4**
Vive solo y carece de hijos o viven alejados	**5**
B. Situación económica	
Más de 1.5 veces el salario mínimo	**1**
Desde 1.5 veces el salario mínimo hasta el salario mínimo exclusive	**2**
Desde el salario mínimo a pensión mínima contributiva	**3**
LISMI – FAS – Pensión no contributiva	**4**
Sin ingresos o inferiores al apartado anterior	**5**
C. Vivienda	
Adecuada a necesidades	**1**
Barreras arquitectónicas en la vivienda o portal de la casa (peldaños, puertas estrechas, baños...)	**2**
Humedades, mala higiene, equipamiento inadecuado (sin baño completo, agua caliente, calefacción...)	**3**
Ausencia de ascensor, teléfono	**4**
Vivienda inadecuada (chabolas, vivienda declarada en ruina, ausencia de equipamientos mínimos)	**5**
D. Relaciones sociales	
Relaciones sociales	**1**
Relación social sólo con familia y vecinos	**2**
Relación social sólo con familia o vecinos	**3**

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No sale del domicilio, recibe visitas	**4**
No sale y no recibe visitas	**5**
E. Apoyo de la red social	
Con apoyo familiar y vecinal	**1**
Voluntariado social, ayuda domiciliaria	**2**
No tiene apoyo	**3**
Pendiente del ingreso en residencia geriátrica	**4**
Tiene cuidados permanentes	**5**
PUNTUACIÓN TOTAL	

8.UCLA - Escala de soledad: Indique con qué frecuencia cada una de las declaraciones a continuación lo describe a usted.

	A menudo	A veces	Rara vez	Nunca
1.- Sintonizo (me llevo bien) con la gente que me rodea				
2.- Me falta compañía				
3.- No tengo a nadie con quien yo pueda contar				
4.- Me siento solo/a				
5.- Me siento parte de un grupo de amigos/as				
6.- Tengo muchas cosas en común con la gente que me rodea				
7.- No tengo confianza con nadie				
8.- Mis intereses e ideas no son compartidos por las personas que me rodean				
9.- Soy una persona abierta (extrovertida)				

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10.- Me siento cercano/a de algunas personas				
11.- Me siento excluido/a, olvidado/a por los demás				
12.- Mis relaciones sociales son superficiales				
13.- Pienso que realmente nadie me conoce bien				
14.- Me siento aislado/a de los demás				
15.- Puedo encontrar compañía cuando lo necesito				
16.- Hay personas que realmente me comprenden				
17.- Me siento infeliz de estar tan aislado/a				
18.- La gente está a mi alrededor pero no siento que esté conmigo				
19.- Hay personas con las que puedo charlar y comunicarme				
20.- Hay personas a las que puedo recurrir				

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9.Escala de experiencias positivas y negativas SPANE

Piense en lo que ha estado haciendo y experimentando durante las últimas cuatro semanas. Luego informe cuánto experimentó cada uno de los siguientes sentimientos, utilizando la escala a continuación. Para cada elemento, seleccione un número del 1 al 5 e indique ese número en su hoja de respuestas.

6. Muy rara vez o nunca
7. Rara vez
8. A veces
9. A menudo
10. Muy a menudo o siempre

- **Positivo**

- Negativo

- Bueno

- Malo

- Agradable

- Desagradable

- Feliz

- Triste

- Miedo

- Alegre

- Enojado

- Satisfecho

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1. PREGUNTAS SOBRE LA EXPERIENCIA CON EL ROBOT ARI

Por favor, conteste a las siguientes preguntas:

- ¿Cómo ha percibido el uso y la integración de la solución digital en su día a día?

- ¿Cómo ha afectado en su día a día? Marque una o varias opciones:
  - ■ Conocimiento sobre la salud
  - ■ Manejo propio de mi salud
  - ■ Apoyo para un envejecimiento activo y saludable
  - ■ Mejora de la calidad de vida
  - ■ Apoyo sanitario en casa
  - ■ Otro
  - ■ Ninguno

- ¿Qué impacto ha tenido en su comportamiento en relación a su salud?

- ¿Cómo ha sido su experiencia al usar la tecnología?

- ¿Cuál es la perspectiva de su familia/amigos/vecinos/cuidadores sobre la tecnología?

- ¿Cómo ha percibido la utilidad de la tecnología?

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- ¿Con qué y cómo le ha apoyado la tecnología?

- ¿Qué le ha gustado más sobre la tecnología?

- ¿Qué le ha gustado menos sobre la tecnología?

- ¿En qué condiciones estaría dispuesto/a a continuar usando las soluciones digitales tras la finalización de este proyecto?

- Si esta tecnología estuviera disponible para su uso en el futuro, cuánto estaría dispuesto/a a pagar por ella al mes? Marque una o varias opciones:
  - ■ < 5€
  - ■ 5-10€
  - ■ 11-20€
  - ■ 21-50€
  - ■ 51-100€
  - ■ > 100€
  - ■ No estaría dispuesto a pagar por la tecnología.

- ¿Quién pagaría por las soluciones digitales? Marque una o varias opciones:
  - ■ Usuario final individual
  - ■ Seguro médico privado
  - ■ Seguro médico público

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- Subvencionado por el gobierno
- Otro:

- ¿Cómo el uso de la tecnología ha afectado a? Marque una o varias opciones:
  - La toma de medicación prescrita:
  - La toma de medicación sin prescripción:
  - Visitas al médico/hospital:
  - Número o frecuencia de sesiones de terapia:
  - Relación con su médico/cuidador/sanitarios/personas de ayuda:

Comentarios adicionales:

¿Quiere compartir algún otro comentario / experiencia / impresión?

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2. Escala de usabilidad del sistema

Marque la respuesta correcta para cada frase según lo de acuerdo o en desacuerdo que esté.

	Totalmente de acuerdo 5	4	3	2	Totalmente en desacuerdo 1
1. Creo que me gustaría utilizar esta tecnología de forma habitual					
2. Me ha parecido demasiado complejo					
3. Me ha parecido muy fácil de usar					
4. Creo que necesitaría ayuda para utilizarlo					
5. Me ha parecido que las funciones estaban bien integradas.					
6. La herramienta es inconsistente.					
7. Creo que la mayoría de las personas aprenderían a utilizar la herramienta rápidamente.					
8. La herramienta me ha parecido rara para su uso.					
9. Me he sentido cómodo/a usando esta herramienta.					
10. Necesito aprender muchas cosas antes de poder usar esta herramienta.					

3. ACEPTACIÓN DE LA TECNOLOGÍA

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Para cada uno de las siguientes afirmaciones, por favor marque con una “X” la casilla que mejor describa su reacción a esta tecnología hoy

	Totalmente en desacuerdo 1	2	3	4	5	6	Totalmente de acuerdo 7
Esta tecnología es fácil de usar							
Esta tecnología es útil para mí							
Si en un futuro esta tecnología estuviera disponible para mí, la utilizaría							

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4. CUESTIONARIO DE LA EXPERIENCIA DE USUARIO UEQ-S

Por favor, rellene el siguiente cuestionario. Este consiste en pares de características opuestas que se refieren al producto que acaba de probar. Los círculos entre las características representan un nivel de gradación entre las dos. Por ejemplo, en la pareja *obstructivo/impulsor de apoyo*, marcar el círculo más próximo a *obstructivo* indicaría que usted identifica el producto como *obstructivo* y, por lo tanto, no lo identifica en absoluto como *impulsor de apoyo*. Si marca el círculo del medio, indicaría que usted encuentra la tecnología en un nivel intermedio entre *obstructivo* e *impulsor de apoyo*.

Ejemplo:

obstructivo ○ █ ○ ○ ○ ○ ○ impulsor de apoyo

obstructivo	o o o o o o o	impulsor de apoyo
complicado	o o o o o o o	facil
ineficiente	o o o o o o o	eficiente
confuso	o o o o o o o	claro
aburrido	o o o o o o o	emocionante
no interesante	o o o o o o o	interesante
convencional	o o o o o o o	original
convencional	o o o o o o o	novedoso

Comentarios:

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5. PREGUNTAS PARTICIPACIÓN SHAPES

Participo lo suficiente en actividades que son importantes para mi (ejemplos incluirían actividades y relaciones con la familia, actividades sociales, de ocio y deportivas, artísticas y culturales, laborales, de aprendizaje y formación, de voluntariado, etc., …). Marque una opción

- Totalmente en desacuerdo
- En desacuerdo
- Ni de acuerdo, ni en desacuerdo
- De acuerdo
- Totalmente de acuerdo

Opcional: Si quiere aportar más detalles o la razón de su respuesta, por favor, hágalo aquí:

____

____

____

El uso del robot ARI hace que participar en actividades que son importantes para mí sean:

- Mucho más difíciles
- Un poco más difíciles
- Igual de difíciles
- Un poco más fáciles
- Mucho más fáciles

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Annex 64

UC-PT1-004 Caregiver End of Pilot Interviews

https://shapes2020.eu/wp-content/uploads/2023/06/Annex_64_PT1_UC004_EndPilot-Interview-Caregiver.pdf

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Annex 65

UC-PT1-001 Data Collected by the eCare Platform in phase 5

Participant	# HR Measurements	# Step Counts	# Sleep Duration Measurements
1	21 036	5 211	-
2	12	13	-
3	6 032	6 324	57
4	7 901	9 594	66
5	2 443	8 491	59
6	316	8 060	60
7	8 518	7 285	63
8	16 084	3 904	40

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Annex 66

UC-PT1-001 Data Collected by the eCare Platform in phase 5_Repliating UAVR

Participant	# HR Measurements	# Step Counts	# Sleep Duration Measurements
1	14 702	1 992	16
2	-	-	-
3	6 226	1 954	10
4	11 300	1 849	14
Total	**32 228**	**5 795**	**40**

Annex 67

UC-PT1-001 Data Collected by the eCare Platform in phase 5 Replicating AIAS

Participant	# HR Measurements	# Step Counts	# Sleep Duration Measurements
1	12 996	4 434	23
2	97	4 600	28
3	-	-	-
4	22	30	2
Total	**13 115**	**9 064**	**53**

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