SHAPES

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

D3.9 – Final User Requirements for the SHAPES Platform

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Revision History

Table 1 Revision History

Revision #	Date	Editor	Comments
v_0.3	17.03.2021	Shared with WP3 partners for additional contributions and review	Mainly spelling errors, some requests with respect to functionalities and alignment with WP6
v_0.4	30.03.2021	Claudia Berchtold, Larissa Müller	Integration of feedback/input from SHAPES partners, Editing
		Lisa Cesarion and Evert-Jan Hoogerwerf (AIAS); Eleni Zarogianni and Artur Krukowski (ICOM)	Peer Review

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v_0.5	19.04.2021	Integration of review comments by FhG (Claudia Berchtold)	n.a.
v1.0	23.04.2021	Submission to coordinator	

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Table of Contents	
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Table of Acronyms and Abbreviations

Table 3 Acronyms and Abbreviations

Acronym	Full Term
AB	Availability
AC	Accessibility
AD	Adaptability
BR	Business Requirements
CO	Collaboration
CP	Capacity
CS	Cybersecurity
CS	Customer Service
ET	Ethics for Platform
FR	Functional Requirements
FT	Functionality
GE	General Ethics
GSA	General Security Aspects
HMS	Health Maintenance Support
HS	Health Support
IO	Interoperability
IS	Information Services
LER	Legal and Ethical Requirements

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LS	Living Support
M	Marketplace
ME	Ethics for Governance, Business and Ecosystem Models
MN	Maintainability
OS	Openness
P	Pricing
PE	Ethics for Processes and Support
PF	Performance
RB	Reliability
RC	Recoverability
RM	Rights Management
S	Sustainability
SC	Scalability
SR	Security Requirements
TR	Technical Requirements
US	Usability
PwM	People with Multimorbidity
WPs	Work Packages

Keywords

SHAPES Platform, User Needs, Dimensions, Requirements

Disclaimer

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Table of Contents

1 INTRODUCTION 1

1.1 RATIONALE AND PURPOSE OF THE DELIVERABLE 1

1.1.1 Deliverable Objectives 1

1.1.2 Key inputs and outputs 1

1.2 INTEGRATION OF REVIEW COMMENTS 3

1.3 STRUCTURE OF THE DOCUMENT 4

2 METHODOLOGY 5

2.1 DISTINGUISHING THE SHAPES PLATFORM FROM PRODUCT DESIGN 5

2.2 BUILDING ON EXISTING KNOWLEDGE AND TRUST 6

2.2.1 Existing research and projects 6

2.2.2 Links to the "Health and Care Cluster Projects" 7

2.2.3 Link with other SHAPES Tasks and user group interaction 8

3 SPECIFICATION OF PLATFORM REQUIREMENTS 11

3.1 SUMMARY OF 1ST ITERATION (D3.7) 11

3.1.1 Functional and non-functional requirements 11

3.1.2 Requirements coding 11

3.2 SUMMARY OF THE 2ND ITERATION 12

3.2.1 Interaction with WPs 2, 3, 4, 5, 7 and 8 12

3.2.2 Interaction with WP6 "Pan-European Pilot Campaign" 16

3.2.3 Adaptations of Platform Requirements based on interaction during the 2nd iteration .. 17

3.2.3.1 Revision of dimensions, actors and requirements 17

3.2.3.2 Integration of additional requirements 18

3.2.3.2.1 Task 2.1 Link: Insights from "Understanding older people" 18

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

3.2.3.2.2 Task 2.4 Link: Aligning platform requirements and policy design 18

3.2.3.2.3 Task 3.1 Link: Requirements relating to health system specificities 18

3.2.3.2.4 Task 3.2 Link: ProACT project requirements 19

3.3 SUMMARY OF THE 3RD ITERATION 20

3.3.1 Cross-checking of requirements 20

3.3.2 Mapping of user requirements for SHAPES pilots 22

3.3.3 Online Workshops with the User Requirements Board 23

3.3.3.1 Functional Requirements workshop 23

3.3.3.2 Ethical Requirements Workshop 29

3.3.4 Surveys 33

3.3.4.1 Technical and security requirements 34

3.3.4.2 Business requirements 37

3.3.4.3 The World Federation of the Deafblind (WFDB) 39

3.3.5 Feedback from end-user interaction 40

3.3.5.1 Feedback from interviews conducted by Omnitor 41

3.3.5.2 Workshop with AGE Taskforce on Dignified Ageing (Task 4.2) 47

3.3.5.3 Olomouc University, Social Health Institute 48

3.3.6 Requirements derived from personas 49

4 OVERVIEW OF SHAPES PLATFORM REQUIREMENTS 51

4.1 FUNCTIONAL REQUIREMENTS (CODING: FR) 52

4.2 LEGAL AND ETHICAL REQUIREMENTS (CODING: ET) 73

4.3 SECURITY AND TECHNICAL REQUIREMENTS (CODING: STR) 80

4.4 BUSINESS REQUIREMENTS (CODING: BR) 89

5 CONTEXTUAL FACTORS TO THE PLATFORM IMPLEMENTATION 92

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

6 CONCLUSION 94

7 PUBLICATION BIBLIOGRAPHY 95

8 ETHICAL REQUIREMENTS CHECK 97

ANNEX I – MAPPING OF REQUIREMENTS EXTRACTED FROM TASK 3.1 "ECOLOGICAL ORGANISATIONAL MODELS OF HEALTH AND CARE SYSTEMS FOR AGEING" 98

ANNEX II – MAPPING OF PROACT REQUIREMENTS AGAINST SHAPES PLATFORM REQUIREMENTS 107

ANNEX III MAPPING OF FEEDBACK ON PLATFORM REQUIREMENTS NHSCT 113

ANNEX IV – MAPPING OF FEEDBACK ON PLATFORM REQUIREMENTS CLÍNICA HUMANA 115

ANNEX V – MAPPING OF USER REQUIREMENTS DEVELOPED BY THE SHAPES PILOTS (WP6 LINK) 118

PT-01-001 118

PT-01-004 120

PT-02-001 123

PT-02-002 129

PT-02-003 131

PT-03-GENERAL 133

PT4-002 (DRAFT) 137

PT-05-001 139

PT-05-004 143

PT-06-002 145

ANNEX VI – VIDASOR PROJECT AS EXAMPLE FOR THE APPLICATION OF TOTAL CONVERSATION 150

ANNEX VII – RESULTS OF THE TASK 3.5 REQUIREMENTS SURVEYS 152

SURVEY TECHNICAL AND SECURITY REQUIREMENTS 152

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

SURVEY BUSINESS REQUIREMENTS 155

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

List of Figures

FIGURE 1: ITERATIONS OF SHAPES PLATFORM REQUIREMENTS, RESEARCH CONDUCTED AND RESULTS DERIVED 1

FIGURE 2: TASK 3.5 LINKS WITH SHAPES WPS AND TASKS 2

FIGURE 3: GENERAL PROCESS FOR USER REQUIREMENTS ANALYSIS 5

FIGURE 4: OVERVIEW OF TASK 3.5 WORKFLOW. 6

FIGURE 5: OVERVIEW OF THE HEALTH AND CARE CLUSTER PROJECTS 8

FIGURE 6: INPUT TO DELIVERABLE 3.9 9

FIGURE 7: INTERACTION WITH SHAPES PLATFORM USER GROUPS AND THEMATIC EXPERTS THROUGH DIFFERENT WPS 13

FIGURE 8: CROSS-CHECKS OF SHAPES PLATFORM REQUIREMENTS MAKING USE OF MIND MAPS 21

FIGURE 9: FUNCTIONAL PLATFORM REQUIREMENTS DIMENSIONS 24

FIGURE 10: EXAMPLE OF THE ONLINE STICKY-DOT METHOD TO RANK REQUIREMENTS 24

FIGURE 11: EXAMPLE OF THE USE OF ONLINE WHITE BOARDS TO RECEIVE QUALITATIVE FEEDBACK ON THE REQUIREMENTS 25

FIGURE 12: SECURITY AND TECHNICAL REQUIREMENTS SURVEY 36

FIGURE 13: BUSINESS REQUIREMENTS SURVEY 38

FIGURE 14: EXAMPLE OF REQUIREMENTS VISUALISATION FOR DISCUSSION WITH END-USERS. 41

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

List of Tables

TABLE 1 REVISION HISTORY II

TABLE 2 DELIVERABLE CONTRIBUTORS III

TABLE 3 ACRONYMS AND ABBREVIATIONS III

TABLE 4: INTERACTION WITH OTHER SHAPES TASKS 2

TABLE 5: INTEGRATION OF REVIEW COMMENTS 3

TABLE 6: OVERVIEW OF EXCHANGES WITH SHAPES PARTNERS AND MEANING FOR SHAPES PLATFORM REQUIREMENTS 13

TABLE 7: REVIEW AND INTEGRATION OF USER REQUIREMENTS FROM SHAPES USE CASES 22

TABLE 8: ORGANISATIONS PARTICIPATING IN THE FUNCTIONAL REQUIREMENTS WORKSHOP 23

TABLE 9: ORGANISATIONS PARTICIPATING IN THE ETHICAL REQUIREMENTS WORKSHOP 29

TABLE 10: COLOUR-CODING SYSTEM RELATED TO THE RANKING (RELATIVE IMPORTANCE) OF PLATFORM REQUIREMENTS 51

TABLE 11: EXPLANATIONS ON GENERAL COMMENTS RELATED WITH LEGAL AND ETHICAL REQUIREMENTS 73

TABLE 12: TECHNICAL AND SECURITY REQUIREMENTS 152

TABLE 13: BUSINESS REQUIREMENTS 155

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

Executive Summary

This Deliverable encompasses the 3rd and final iteration of the SHAPES platform requirements as enhanced between M13 and M18 of the project implementation timeline, i.e. November 2020 and April 2021. However, it describes the development process of the requirements including the 1st (D3.7 Draft User Requirements V1 for the SHAPES Platform) and 2nd iteration (Draft User Requirements for the SHAPES Platform V2) and can hence be read as a stand-alone document.

The Deliverable describes the methodology for developing the SHAPES Platform Requirements (chapter 2), the working steps that have been taken in order to develop the requirements, including the results for the User Requirements (chapter 3) and finally a synthesis of all insight, i.e. the final overview of the requirements in chapter 4.

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1 Introduction

1.1 Rationale and purpose of the deliverable

The rationale of Task 3.5 and the related Deliverables (3.7-3.9) was the development of the SHAPES platform requirements. Building on the 1st iteration which was submitted in June 2020 (Deliverable 3.7) and the 2nd iteration (submitted in October 2020), interviews, small online workshops as well as two surveys were implemented between October 2020 and February 2021 to specify the subcategories and requirements for the platform. The overall structure for Task 3.5 including the 3rd iteration is detailed in the figure below.

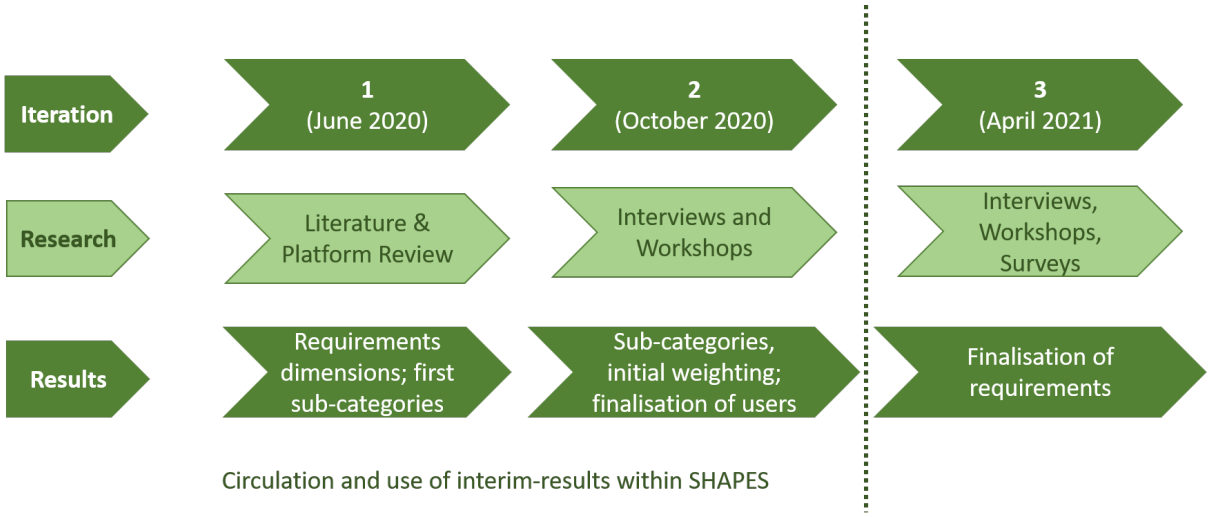

Figure 1: Iterations of SHAPES Platform Requirements, research conducted and results derived

1.1.1 Deliverable Objectives

The main objective of Task 3.5 was the development of user-centred requirements for the SHAPES Platform, validated by the SHAPES Ecosystem of relevant stakeholders, in line with an agile, iterative co-design and co-development processes. This process should ensure that care recipients' and care providers' needs, priorities, contexts, challenges and opportunities, as well as the specific gendered human factors and organisational aspects are taken into consideration in the development of the platform.

1.1.2 Key inputs and outputs

Figure 2 below specifies the links of Task 3.5 to almost every WP in SHAPES.

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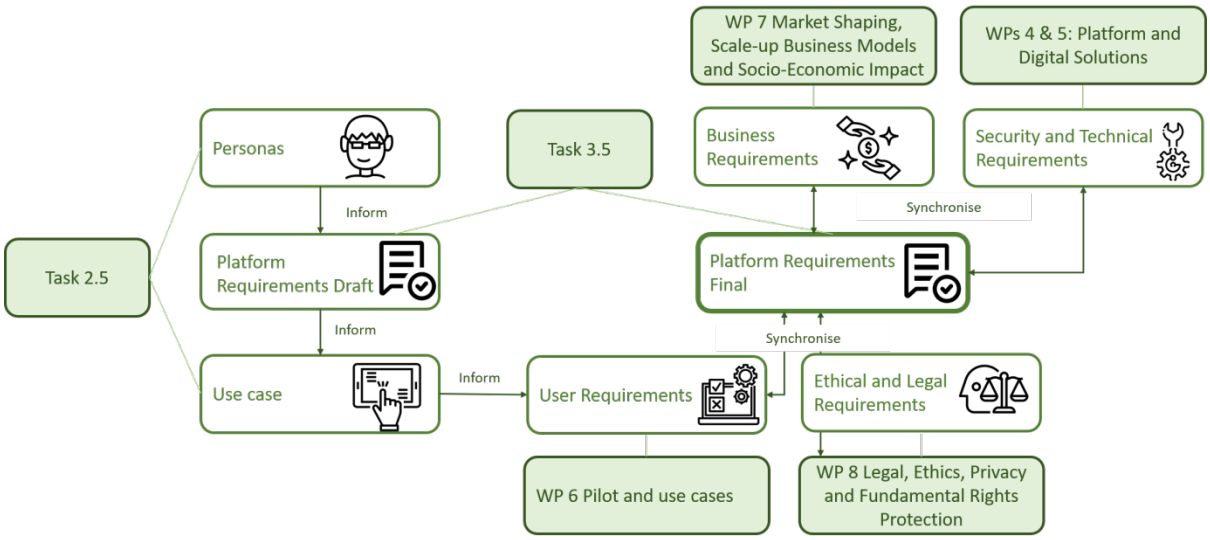

Figure 2: Task 3.5 Links with SHAPES WPs and Tasks

Table 4 lists the most important tasks that provide input to the development of the platform requirements:

Table 4: Interaction with other SHAPES Tasks

Task #	Title	Duration
2.1	Understanding Older People: Lives, Communities and Contexts	M1-M24
2.2	Accessing Physical Spaces	M1-M24
2.3	Cultivating Age-Friendliness	M7-M36
2.4	Empowerment of Older Individuals in Health and Care Decision-making	M13-M36
2.5	SHAPES Personas and Use Cases	M1-M18
3.1	Ecological Organisational Models of Health and Care Systems for Ageing	M1-M12
3.2	Scaling-up Improved Integrated Care Service Delivery	M7-M30
3.4	SHAPES Governance Model and Guidelines	M7-M42
5.1	Platform User Experience Design Guidelines and Evaluation	M4-M36
6.1	SHAPES Pan-European Pilot Campaign Plan, Knowledge Model and Evaluation Methodology	M1-M6
7.3	SHAPES Ecosystem Business Models and Uptake Roadmap	M37-M48
8.1	SHAPES Pan-European Pilot Campaign Plan, Knowledge Model and Evaluation Methodology	M1-M48
8.2	Assessing the Regulatory Frameworks Facilitating Pan-European Smart Healthy Ageing	M7-M42
8.3	Ethical Framework for SHAPES	M1-M6
8.4	Privacy and Ethical Risk Assessment for the SHAPES Platform	M7-M42
8.5	Privacy and Data Protection Legislation in SHAPES	M7-M48

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Consequently, Deliverable 3.9 built on the following Deliverables:

- D2.5: SHAPES Personas and Use Cases V1 and its subsequent versions D2.6-2.7, the latter in its draft version (Tavel et al. 2020)
- D3.1: SHAPES Ecological Organisation Models (Labor and Cooke et al. 2020
- D3.2: Scaling-up Improved Integrated Care Delivery V1 (Hoogerwerf et al. 2021)
- D6.1: SHAPES Pan-European Pilot Campaign Plan (Grigoleit et al. 2020)
- D8.2: Baseline for Project Ethics and Data Management Plan (Sarlio-Siintola et al. 2020a)
- D8.4: SHAPES Ethical Framework (Sarlio-Siintola et al. 2020b)

In terms of the output, D3.9 and its previous iterations provide input to WP4 and more particularly Task 4.1 "SHAPES TP Requirements and Mapping a Reference Architecture".

1.2 Integration of Review comments

During the 1st technical review, some concerns and risks have been identified by the reviewers. They have been addressed by the 2nd and 3rd iteration of this Deliverable as detailed in the table below.

Table 5: Integration of Review comments

Comments received	Action taken
The requirement analysis is not fully consistent with the definition of personas and use cases presented in D2.5 and is limited in the provided contribution.	The development has been aligned with the personas and uses cases as developed by Task 2.5 and WP6 (see particularly section 3.3.2 and 3.3.6 as well Annex V of this Deliverable).
Sub-categories have been presented at the meeting but they are lacking in the deliverable.	All sub-categories are presented in chapter 4.
It is insufficiently discussed how to collect requirements from patients with the characteristics of the identified persons will be collected.	Interactions with different end-user groups have been specified in section3 and encompassed for example online workshops, interviews and surveys.
The questionnaire for caregivers is related to the possible benefits in the adoption of technologies, but it is not aimed at performing a functional requirement analysis	Additional surveys (see section 3.3.4) as well as interviews and workshop formats have been developed (see particularly section 3.3.3, 3.3.4 and 3.3.5).
It is unclear, which kind of functionalities could improve caregivers' work. Such information is expected in the follow-up deliverable.	The "Comments" column for the requirements details all sorts of additional information per requirements.

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	This encompasses for example the involved stakeholders or particular aspects that need to be considered when implementing the requirements. Specific requirements have been developed with respect to the training and certification of (informal) care givers (such FR-IS-12 and sub-categories)

1.3 Structure of the document

The document specifies the methodology chosen for the development of the platform requirements (Section 2), and details the working steps and insights derived in the three iterations (Section 3):

- 1st iteration: April - June 2020 (Section 3.1)
- 2nd iteration: July - October 2020 (Section 3.2)
- 3rd iteration: November 2020 - April 2021 (Section 3.3)

Whereas the first two iterations encompassed the drafting of the requirements, the last iteration focused on the requirements validation, a consistency check across the requirements and dimensions and a final cross-check against the requirements developed in the pilot sites.

An overview of the requirements is given in Section 4. It represents an extract of the requirements list which was developed as a *Living Excel Document* that was continuously adapted throughout the development process and that was shared across the consortium for continuous use.

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2 Methodology

2.1 Distinguishing the SHAPES platform from product design

"Understanding user requirements is an integral part of information systems design and is critical to the success of interactive systems. It is […] widely understood that successful systems and products begin with an understanding of the needs and requirements of the users" (Maguire and Bevon 2002, p. 133). The development of human-centred design processes for interactive systems is specified in ISO standard 13407:1999 that places the user needs in the centre of the design process. The process steps are usually the following:

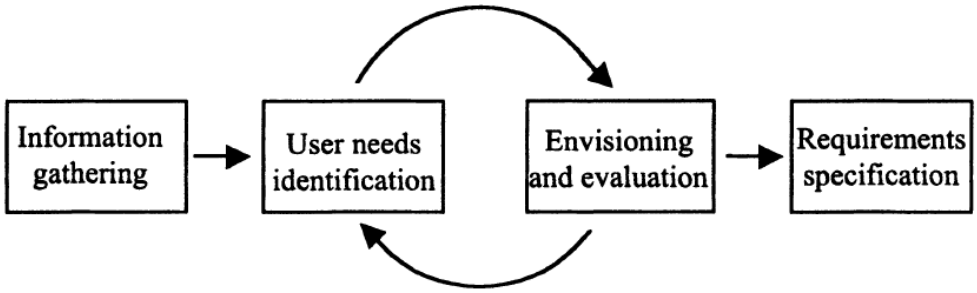

Figure 3: General process for user requirements analysis

Source: (Maguire and Bevon 2002, p. 134)

Frequently, after the specification of the different user groups, their needs are identified by different methods such as interviews, focus groups or surveys (e.g. Maguire and Bevon 2002). This procedure is comparatively linear if it comes to concise products (for example Bruseberg and McDonagh-Philip 2001). A product can be defined as "something that is made to be sold, usually something that is produced by an industrial process or, less commonly, something that is grown or obtained through farming" (Cambridge Dictionary). The SHAPES platform, however, cannot be regarded as a product in this sense. It has to be understood as a *vehicle* to enhance health care for older adults and hence links (health) data and information management aspects with services (e.g. exercises and organisation of support) with dedicated tools such as sensors and robots facilitating certain aspects of health care. It thereby links a multitude of actors (ranging from care receivers to informal care providers, health professionals and health system administrators) in different EU countries with specific living conditions as well as health and care system settings. In order to take this diversity in context into consideration, to build on the work conducted under SHAPES tasks such as Task 2.1: Understanding Older People: Lives, Communities and Contexts or Task 3.1: Ecological Organisational Models of Health and Care Systems for Ageing and particularly to benefit from the specific collaborative open climate that had been established between researcher and end-users, Task 3.5 has closely interacted with relevant tasks as specified in Table 4 above. This methodology is not unique to SHAPES. Other projects in the health cluster, e.g. Vicinity (Open virtual neighbourhood network to connect IoT infrastructures and smart objects)[1] (D2.1

[1] https://www.vicinity2020.eu/vicinity/ (27.10.2020).

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'Requirements specifications for ageing well'), adopted a similar approach in combining different approaches of stakeholder interaction.

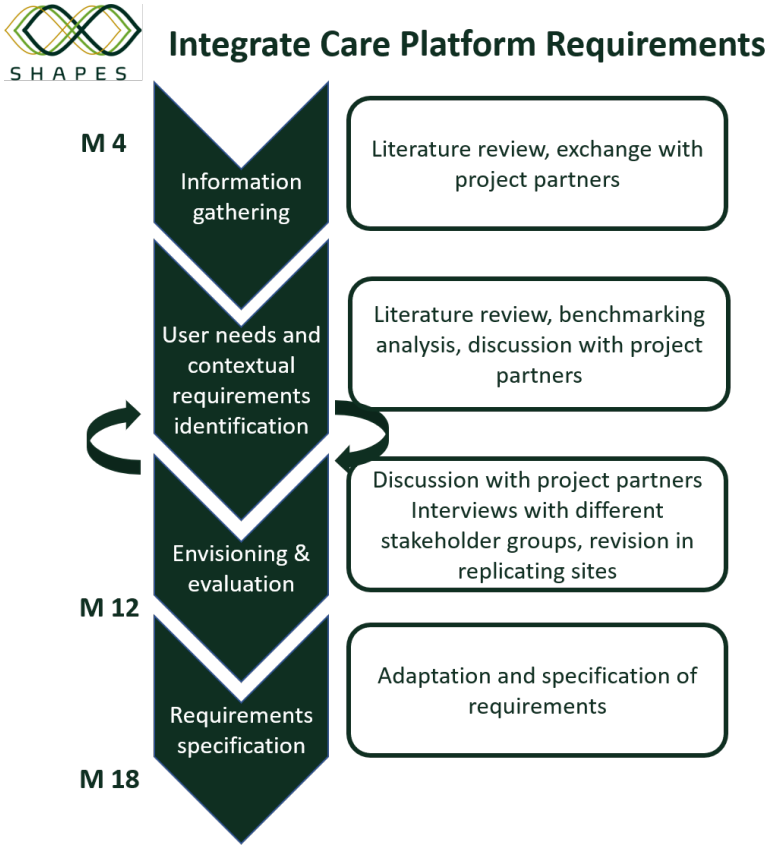

Figure 4: Overview of Task 3.5 Workflow.

Overall, the identification of functional and non-functional requirements phase was based on several steps as detailed in Figure 4. It included the review of projects similar to SHAPES and a more in-depth literature review relating to the requirements dimensions identified in step one. This phase was complemented by discussions with project partners, mostly WP2-WP8 representatives, and the Excel Sheet with platform requirements was made available for their review. The requirements specification and validation with stakeholder groups was completed in the 3rd iteration.

2.2 Building on existing knowledge and trust

2.2.1 Existing research and projects

A rich knowledge base on requirements for e-health systems and platforms already exists. For the SHAPES project, it was therefore decided to build an initial version of the requirements on research and projects that have been implemented. In the first iteration of the SHAPES Platform Requirements, the requirements dimension and first differentiation of actors were therefore based on literature review and a project review, building on the CORDIS project results database[2]. Using the search term 'platform' in

[2] https://cordis.europa.eu/ (30.09.2020).

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the Cordis database yielded over 5,000 search results. This list of projects was screened for projects that develop a technology platform similar to the one envisaged by SHAPES. An initial ten projects were reviewed in detail, which entailed an analysis of how the project had developed their requirements and what types of requirements in general and what specific requirements they had identified.[3] This relatively small sample size compared to the more than 5,000 hits from the search already yielded a plethora of requirements. It is interesting to note that with regard to the overall types of requirements, these were indeed quite congruent. In order to test if any projects that specifically work in the health sector developed completely different types of requirements, another Cordis search with the keywords 'platform AND health' was conducted. This search yielded over 1,460 hits for just H2020 projects. Another five projects were assessed in the same way as before.[4] As was expected, these health specific projects utilised similar approaches to develop requirements and had identified similar categories of requirements.

2.2.2 Links to the "Health and Care Cluster Projects"

Similar projects to SHAPES are currently taking place within the Health and Care Cluster Projects (figure 5). These have progressed to varying degrees with regard to the development of user requirements. The projects pharaon[5], ADLIFE[6], Gatekeeper[7] and FAiTH[8] are still in their planning phase or have not made their requirements public. As mentioned above, ACTIVAGE[9] uses the same approach as SHAPES. InteropEHRate[10] has identified requirements, which pertain directly to scenarios and to each of the technologies that they are developing and testing. SMART BEAR[11] also identified requirements for each of the specific applications that they are working towards (see D2.1 (D5) 'SMART BEAR requirements'[12]). In addition, they have identified technical requirements regarding their platform and cloud and addressed general issues with regard to legal and ethical issues like data protection. This approach defining different dimensions including technical, legal and ethical aspects hence aligns with the approach that was followed in the SHAPES project as well.

[3] The projects were: BONSEYS, PLUGGY, SoCaTel, SWAMP, PlatformUptake.eu, MetaPlat, openMOS, Mobile-Age, Vicinity, SIMPATICO.
[4] The projects were: iManageCancer, Picaso, REACH2020, FrailSafe, i-PROGNOSIS.
[5] https://www.pharaon.eu/ (28.10.2020).
[6] https://adlifeproject.com/ (28.10.2020).
[7] https://www.gatekeeper-project.eu/ (28.10.2020).
[8] https://www.h2020-faith.eu/ (28.10.2020).
[9] https://activageproject.eu/ (28.10.2020).
[10] https://www.interopehrate.eu/ (28.10.2020).
[11] https://www.smart-bear.eu/ (28.10.2020).
[12] https://www.smart-bear.eu/wp-content/uploads/2020/01/D5-D2.1.pdf (28.10.2020).

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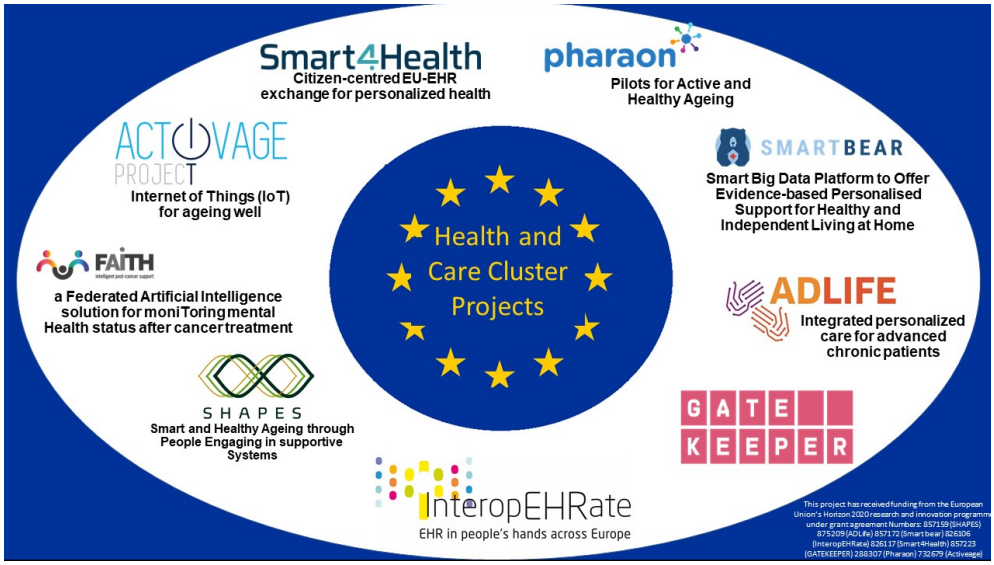

Figure 5: Overview of the Health and Care Cluster Projects

Source: SHAPES Project (2020): Large Scale Pilots[13]

2.2.3 Link with other SHAPES Tasks and user group interaction

In addition to this review, the development of the platform requirements was intended to be linked closely with the SHAPES tasks as described above i) to ensure the integration of generated findings into the requirements development, ii) to exploit the established interaction and trust with actors in other tasks (and particularly under 2.1 *Understanding Older People*) as well as to iii) overcome language barriers existing with several pilot sites and use cases. Finally, this also eased the integration of a range of different views by limiting the number of personal contacts due to COVID-19.

The exchange with the different SHAPES Task for the 2nd and 3rd iteration of the platform requirements is detailed in Section 3 below. During the 1st iteration, the main exchange took place with Task 2.5 (*SHAPES Personas and Use Cases*) to include the needs of the different care receiver personas and Task 3.1 (*Ecological Organisational Models of Health and Care Systems for Ageing*) to include T3.5 aspects into the analysis of the different health care systems. In collaboration with Task 3.1, knowledge needs have been formulated by Task 3.5 for consideration in the review and interviews conducted under Task 3.1. They encompassed the following questions:

1. What digital technologies are you currently using as a care provider?
    a. Briefly describe the most important ones (maximum of 3).
    b. When did you introduce them?
    c. What are the advantages of using these technologies?
    d. What are the disadvantages of using these technologies?

[13] https://shapes2020.eu/projects/large-scale-pilots/ (28.10.2020).

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   e. While using these technologies, what are/were the major concerns and obstacles (i.e. personal skills, organizational problems, technical issues/limitations)?
2. If more digital solutions were to be introduced in your unit, what additional elements would you require (e.g. training for workers, more computers, high-speed internet access)?
3. Is there a way of linking any of these technologies?
4. With regard to the user experience of the platform, what information do you need to have in order to be able to use it?
5. Will the platform be used by every individual care giver?
6. How many users do you think will need to have access to the platform?
7. Will you have a single user of the platform (e.g. someone in management)?

To the extent possible, these were considered in the Task 3.1 analysis and interviews. Feedback was received from Task 3.1 in the form of requirements and needs extracted from the analysis of the different health care systems as detailed in section 3.2.3.2.3 and Annex I.

For the 3rd iteration, several sources and several SHAPES partners were involved in collecting data and enlarging, adapting and revising the requirements as the figure below depicts.

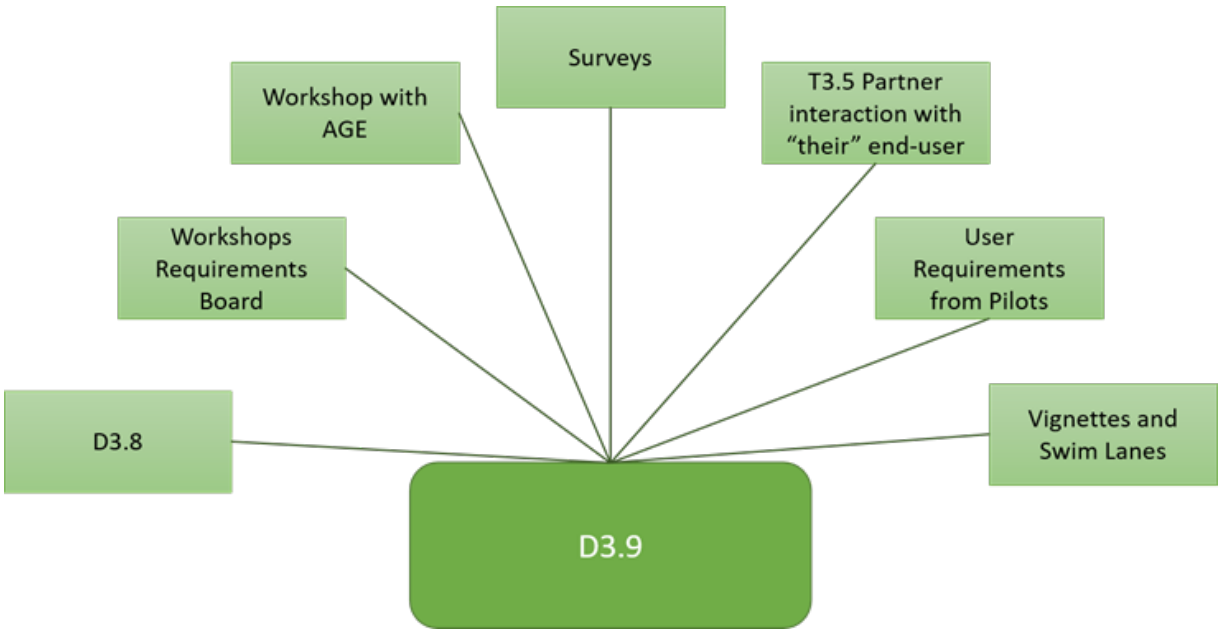

Figure 6: Input to Deliverable 3.9

A *Requirements Board* was set-up, being composed of selected SHAPES partners reflecting the different user groups for validation and weighting purposes. Two workshops were carried out: one focussing on the functional requirements and another one focussing on the ethical requirements. Two surveys were carried to gain feedback on the technical and security requirements and the business requirements. The vignettes, swim lanes and personas were considered and requirements were derived

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from these two tasks of the project. A session with the Taskforce on dignified ageing (T 3.5) was carried out and analysed. In addition, exchange with the pilot sites and use cases under WP 6 was organised and additional surveys were implemented to include the views of the whole consortium. The basis for all these activities were the requirements that were part of Deliverable. Hence, for the 3rd iteration, various actions were taken to consider and implement diverse point of views, different actors and many fruitful perspectives.

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3 Specification of Platform requirements

3.1 Summary of 1st Iteration (D3.7)

3.1.1 Functional and non-functional requirements

As a result of the project and literature review that took place in the first iteration of this Deliverable, six requirements dimensions had been developed:

- Functional Requirements
- Non-functional requirements:
    - Security
    - Ethical & Legal
    - Health system
    - Business
    - Technical

Each of the dimensions (functional and non-functional) was divided into several sub-categories and exemplary requirements specifications. The dimensions, actors and requirements were refined and expanded during the 2nd iteration as described below. Of course, these categories are not always explicit in the sense that some requirements could also fit several categories. For example, Ethical Requirement ET3 (Create functionalities for the end-user to switch off/on various sensors and services whenever she/he want to do it.) could also be a Functional Requirement. To avoid duplication to the extent possible, it was however decided to assign them to the category that seemed to be most fitting.

3.1.2 Requirements coding

In order to be able to use and track the final platform requirements, they will each have a specific identification code. This code is made up of four sequences: <category>-<sub-category>-<number>-<user identification>.

Each category of requirements has a specific code, as follows:

- Functional requirements: FR

Non-functional requirements:

- Security: S
- Legal and Ethical: LE
- Health System: HS
- Business: B
- Technical requirements: TR

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Similarly, each sub-category in every main category also has a unique code. For example, for the functional requirements, the following sub-categories had been envisaged:

- General: G
- Health Support: HS
- Information Services: IS
- Health Maintenance Support: HMS
- Living Support: LS

The third sequence element is a number, which starts at one for each sub-category.

A final requirement could, for example, look like this: FR-HS-1 (Functional Requirement; Health Services; First requirement).

3.2 Summary of the 2nd Iteration

The interaction with the SHAPES WPs can be differentiated into two main building blocks: the interaction with WPs 2, 3, 7 and 8 and the exchange with the SHAPES pilot sites and solutions to be integrated into the platform through WP6 interaction.

3.2.1 Interaction with WPs 2, 3, 4, 5, 7 and 8

Interactions with multiple SHAPES partners from different WPs took place between July and October 2020. More particularly, the following telephone conferences and exchanges have been organised, mostly via Teams. The different actor groups are illustrated in the figure below and specified in Table 6.

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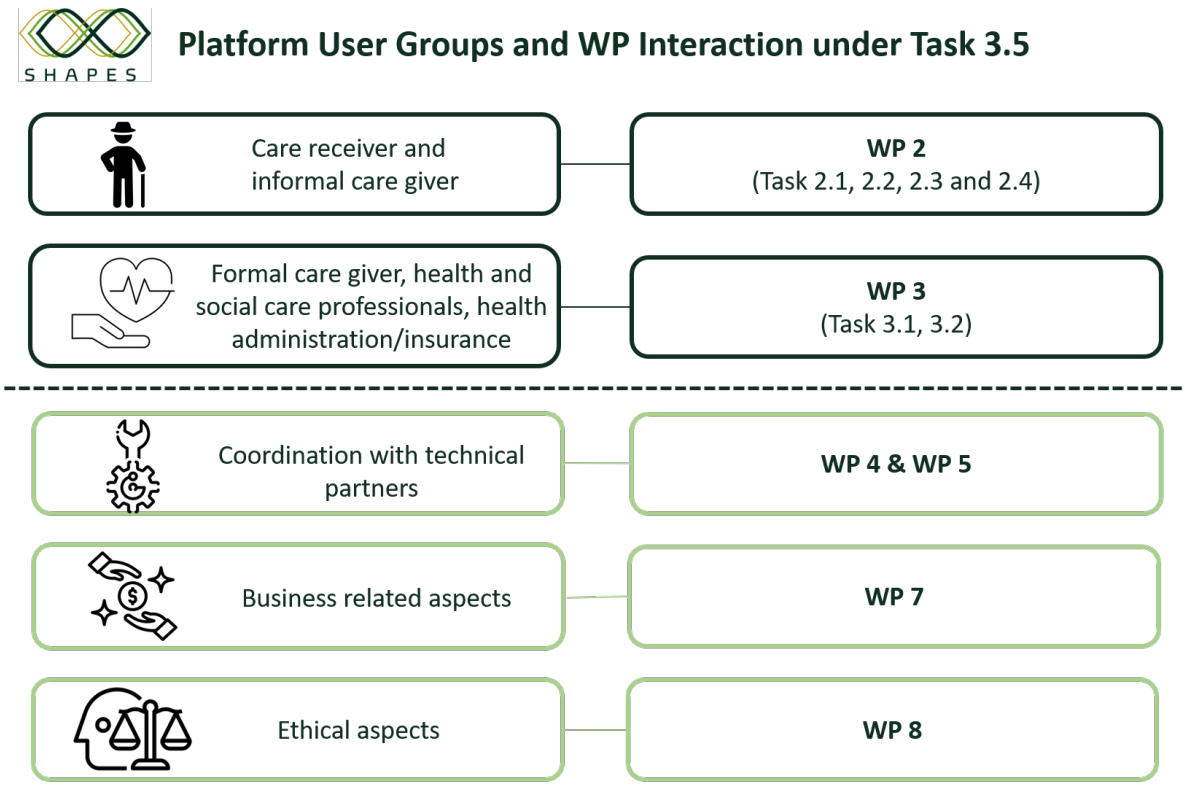

Figure 7: Interaction with SHAPES Platform User Groups and thematic experts through different WPs

Table 6: Overview of exchanges with SHAPES partners and meaning for SHAPES platform requirements

Date	Partners Involved	WP/Task Link	Discussion subject | Conclusion
4.8.2020	Tatiana Silva (TREE), Mark Donnelly (Ulster), Evert-Jan Hoogerwerf (AIAS), Victor Fernandez-Carbajales Cañete (TREE), Bettina Meeren (GEWI), Meftah Ghrissi (KOMPAI), Michael Scott (NHSCT), Andreas Andreou (UNRF), Fotis Gonidis (GNOMON), George Bogdos (FINT), Evangelos Stamatiadis & Fotios Gioulekas & Athanasios Tzikas & Rania Pinaka & Konstantinos	WP4 and WP5	Agreement on dimensions and revision/expansion of user groups; deleting of technology partners as users.

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	Gounaris (5th YPE), Wai Hang Shek (OMNITOR), Lucia D'Arino (WFDB), Deirdre Desmond (NUIM), Valentina Fiordelmondo (AIAS), Oscar Villacanas (CH), Niamh Redmond (NUIM), Paul Isaris (SciFY), Maria Metaxa (AUTH), Dewar Finlay (Ulster), Christoph Kokelmann, Emma McEvoy, Claire Scullin (NHSCT), Tereza Norbertová (FNOL)		
12.8.2020	Melanie Labor (NUIM)	Task 3.1 "Ecological Organisational Models of Health and Care Systems for Ageing"	First thoughts on how to integrate the findings of the Health Ecosystems into Task 3.5.
28.8.2020	Evert-Jan Hoogerwerf (AIAS)	Task 3.2 "Scaling-up Improved Integrated Care Service Delivery"	Establishing a link with the ProACT project and more particularly its user requirements.
1.9.2020	Sari Sarlio-Siintola and Nina Alapuranen (LAUREA)	Task 8.4 "Privacy and Ethical Risk Assessment for the SHAPES Platform"	Integration and ranking/prioritisation of D8.4 findings.
2.9.2020	Exchange with Donal McClean and Matt McCann (Access Earth)	Task 2.2 "Accessing Physical Spaces"	Platform Requirements from Access Earth User perspective.
3.9.2020	Exchange with Lucia D'Arino (WFDB) and Frankie Picron and Mark Wheatley (EDU)	Accessibility Board (WP1)	Platform Requirements from Accessibility perspective
9.9.2020	Ian Spero (AAA)	Task 2.3 "Cultivating Age-Friendliness"	Stressing the need for interoperability, scalability and

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			sustainability of the platform
10.09.2020	Melanie Labor (NUIM)	Task 3.1 "Ecological Organisational Models of Health and Care Systems for Ageing"	Submission of platform requirements extracted from Task 3.1.
15.09.2020	Barbara Guerra and Marco Manso (EDGE), Tatiana Silva (TREE), Alexia Zurkuhlen and Bettina Meenen (GEWI), Evangelos Markakis, Skepasianos Iraklis and Yannis Nikoloudakis (HUM)	WP7 Meeting for the development of business requirements	Integration of business requirements for the SHAPES platform
28.09.2020	Katja Seidel, Jamie Saris and David Prendergast (NUIM),	Task 2.1 "Understanding older people"	Collaboration on the validation and weighting of requirements; integration of research results from Task 2.1
30.09.2020	Borja Arrue (AGE)	Task 2.4 "Empowerment of Older Individuals in Health and Care Decision-making"	Synergies between 3.5 and 2.4, envisaging a joint consultation workshop to validate and weight the requirements.
21.10.2020	Katja Seidel (NUIMI)	Task 2.1	Feedback on the platform functionalities from an ethnographic point of view

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3.2.2 Interaction with WP6 "Pan-European Pilot Campaign"

In terms of WP-6 interaction, an exchange took place during the WP meeting on 10th September 2020:

Date	Partners Involved	Discussion subject | Conclusion
26.8.2020	Nicola Goodfellow (NHSCT)	Health System Professional Requirements
10.09.2020	WP6 online meeting, Participants: Niamh Redmond & A. Jamie & Richard Lombard-Vance & Deirdre Desmond (NUIM), Corina Röllig (CCS), Bettina Meeren (Gewi), Michael Scott and Claire Scullin (NHSCT), Anabela Silva & Oscar Ribeiro (UAVR), Xavier del Toro Garcia (UCLM), Pedro Rocha (UPORTO), Evangelos Stamatiadis & Fotios Gioulekas & Athanasios Tzikas & Rania Pinaka & Konstantinos Gounaris (5th YPE), Eduardo Carrasco & Mannex Serras (VICOM), Ioanna Dratsiou & Maria Metaxa (AUTH), Ronan O'Sullivan (UCC), Artur Krukowski (ICOM), Andreas Andreou (UNRF), Christoph Kokelman (MedicalSyn), Tereza Norbertova (FNOL), Yannis Nikoloudakis & Iraklis Skepasianos (HMU), David Gonzalez Barrera (TREE), Dewar Finlay (ULS), Sarah Cooper (PAL), Paul Isaris (SciFY), Mefthah Grissi (KOM), Oscar Villacañas (CH), Lucia d'Arino (WFDB), George Bogdos (FINT), Barbara Guerra (EDGE)	Information requested with respect to platform requirements and requirements for digital solutions
13.10.2020	Nicola Goodfellow (NHSCT)	Feedback on platform requirements (see also Annex III)
20.10.2020	Óscar Villacañas (CH)	Feedback on platform requirements (see also Annex IV)

WP6, just as the above-mentioned WPs, has overlaps with the development of the SHAPES platform requirements. Most importantly, the *pilots* organise the interaction with the study sites and actors with respect to particular digital solutions and platform

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functionalities. To ensure that the needs of the actors in the different study sites are taken into consideration for the platform requirements, a two-way process was initiated. On the one hand, *pilot* sites were asked to develop requirements for the platform with their end-user, i.e. the older people they are working with. More particularly, partners were asked to identify requirements with respect to and including the examples detailed below:

- **Functionalities** (for example measuring of nutrition intake, dedicated information spaces, etc.)
- **Legal and Ethical aspects** (for example data protection etc.)
- **Security** (for example cybersecurity, resilience of platform, etc.)
- **Technical aspects** (for example scalability, interoperability, etc.)
- **Business aspects** (for example, selection of cost-benefit effective devices, etc.)

On the other hand, pilot and replicating sites developed user requirements for the digital solutions they intend to apply and which will interoperate with the platform. While the digital solutions are distinct from the platform, the requirements were scanned and mapped against the Draft version of the SHAPES platform requirements particularly with respect to the functionalities that the platform should encompass. Platform requirements were expanded accordingly. This undertaking was further processes during the 3rd iteration as detailed in section 3.3.2 below.

3.2.3 Adaptations of Platform Requirements based on interaction during the 2nd iteration

After the discussions with the project partners as sketched above, the following main adaptation were made:

3.2.3.1 Revision of dimensions, actors and requirements

- **Deletion of technical partner/technology providers as user group**. Although this group will interact with the platform, its remit is primarily as a service provider that needs to design the products and services according to the main actors, i.e. care receiver, care giver (formal and informal), health and social care professionals as well as health administrators and insurances.
- **Specification of actors**. The actors were further specified, reframing “doctors” to health care professionals and integrating social care professionals. In addition, the requirements were linked with the actors for they are of relevance.
- Deletion of **health dimensions**. Since there were main overlaps with the functional requirements, such needs were integrated into the functional dimension.
- **Reorganisation and ranking of ethical and legal requirements**. Jointly with WP8, ethical requirements were prioritised. Some aspects were moved to the technical and security dimensions (e.g. data protection aspects) where they seemed to fit more naturally.
- **Integration of accessibility requirement**. Accessibility was integrated as a high priority technical requirement for the platform to be inclusive. The VidAsor

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(Project video assistance and accompaniment for deaf seniors) can serve as an example of how to implement total conversation (see Annex VI).

3.2.3.2 Integration of additional requirements

3.2.3.2.1 Task 2.1 Link: Insights from "Understanding older people"

In the exchange with Task 2.1 "Understanding Older People: Lives, Communities and Contexts" several requirements were formulated based on the in-depth interviews of which about 25 have been completed so far. The main requirements were to:

i) Design the platform in a way that resembles technologies that older people use in their every-day life. It was hence suggested to build on structures that are used for example in online-banking
ii) Allow for an easy to adjust appearance, i.e. contrasts, fonts, etc. Some older people may easily understand how to adapt the appearance and thus greatly increase ease of use. Others may however not be familiar with adjusting respective appearances and might need support for this. Overall, the adjustability should also relate to the content of relevance since different people have different needs.
iii) Stick to the "two-click-rule" and make use of a double menu at the top and at the side. If the platform is too difficult to navigate, it will not be used.

In addition to these requirements, the functional requirements were discussed by and linked with the ethnographic research conducted by Task 2.1. Overall, the requirements are hence linked with qualitative aspects that need to be considered when implementing certain functionalities of the platform. For the next iteration, Task 2.5 will review the requirements and link them with the insights from their research as well.

3.2.3.2.2 Task 2.4 Link: Aligning platform requirements and policy design

Task 2.4 "Empowerment of Older Individuals in Health and Care Decision-making" only starts in M13. However, Task leader AGE Platform Europe is "a European network of non-profit organisations of and for people aged 50+, which aims to voice and promote the interests of the 200 million citizens aged 50+ in the European Union (Eurostat, 2018) and to raise awareness of the issues that concern them most."[14] In order to discuss certain aspects of ageing, AGE works with dedicated thematic *Task Forces* which are comprised of representatives of organisations of older people based in different EU countries. While there are no results yet on which Task 3.5 could build (as Task 2.4 only begins in month 13), it is envisaged to hold a joint workshop for the 3rd iteration of the requirements, involving the Task Force on *Dignified Ageing*.

3.2.3.2.3 Task 3.1 Link: Requirements relating to health system specificities

Task 3.1 "Ecological Organisational Models of Health and Care Systems for Ageing" extracted data from the CONOPS matrix which was created as part of the data

[14] AGE Platform, About AGE, https://www.age-platform.eu/about-age (01.10.2020).

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gathering activities for D3.1. This data was partially gathered through interviews with relevant SHAPES partners, the WHO Health Systems in Transition Series[15] and the Challenges in Long-Term Care series[16]. Task 3.1 thereby established the link to the health system models considered in SHAPES. The list of requirements derived can be found in Annex I. They were mapped against the Draft of the Platform requirements. Requirements covered or integrated are marked green; requirements ignored are marked yellow or red and linked with justifications.

3.2.3.2.4 Task 3.2 Link: ProACT project requirements

The integration of the ProACT requirements was suggested by Task 3.2 (Evert-Jan Hoogerwerf). The requirement study for the ProACT project[17] was performed with the involvement of the most important public health and social care providers in Emilia-Romagna Region (Italy). The study design has followed the following steps:

1) Stakeholder groups and areas of need have been identified.
2) For each stakeholder group, focus group protocols have been co-designed, translated into Italian and used in focus groups.
3) All participants, with the exception of the managers in care have completed the standard demographic data questionnaire.
4) All focus groups have been audio recorded, transcribed and analysed using NVivo.

Stakeholders were divided into the following groups: Adults with multimorbidity, Informal carers, Formal carers, Health professionals, Older people in situations of frailty, Managers in Health and Social Care, Social Workers, and Adults with disabilities. Each group was composed of 4 to 8 people and was involved in two focus group sessions: the first one was focused on personal experiences in care, care pathways, self-management of conditions, challenges and expectations towards health and care services. The second meeting was focused on the use of technology and on the expectations regarding the benefits of the use of technology in the care system. All focus groups were transcribed, transcripts have been analysed both at single stakeholder group level and cross stakeholder thematic level and results were integrated. Key findings identified led to the definition of requirements.

The ProACT platform requirements have been mapped against the SHAPES platform requirements as detailed in Annex II. Some of them had already been considered. Additional requirements were integrated into the platform requirements after assessing their applicability.

[15] https://www.euro.who.int/en/about-us/partners/observatory/publications/health-system-reviews-hits/full-list-of-country-hits
[16] https://ec.europa.eu/social/main.jsp?langId=en&catId=792
[17] http://proact2020.eu/ (09.09.2020).

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3.3 Summary of the 3rd iteration

In the 3rd iteration of developing the SHAPES platform requirements, six working steps have been implemented:

1. Requirements have been cross-checked against each other in terms of overlaps and potential conflicts.
2. Requirements have been mapped against User Requirements developed for the SHAPES Digital Solutions in the pilots (WP6).
3. Online validation workshops have been implemented.
4. Surveys were conducted.
5. Additional end-user interaction based on interviews and a workshop have been implemented.
6. Finally, the revised personas developed by Task 2.5 have been examined with respect to (additional) requirements.

The implementation of these steps including their results is documented in the sections below.

In terms of requirement categories, the security and the technology dimension have been integrated into the “Security and Technology Requirements” dimension (STR).

3.3.1 Cross-checking of requirements

An initial step of the 3rd iteration was the cross checking of requirements developed during the 2nd iteration in order to identify inconsistencies and duplications. This was done using mind maps as sketched in the figure below. In the example, potential conflicts between the Health Support Requirements (on the left) with Ethical Requirements (on the right) were visualised with the help of lines.

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Figure 8: Cross-checks of SHAPES Platform Requirements making use of mind maps

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As a result of this action, duplicated requirements were deleted to the extent useful. Potential conflicts were analysed. However, all potential issues related to ethics and privacy constraints can be overcome by the strict implementation of data protection and ethical requirements.

3.3.2 Mapping of user requirements for SHAPES pilots

A second step taken during the 3rd iteration was continued work from the 2nd iteration relating to the consideration of User Requirements developed under WP6 and more particularly by the individual pilot sites. The digital solutions will in general be able to operate individually and have a range of requirements relate to very specific aspects that are not of relevance for the platform. However, this undertaking aimed to ensure that in general terms, general requirements relating to functionalities that should be available via the platform are recognised and integrated.

Since the timing of the user requirements development for the pilot sites and the finalisation of Deliverable 3.9 deviated in the sense that D3.0 had to be completed by M18 whereas the pilots have been organized in different pilot cycles requiring completed user requirements only around M26 as for example in the case of pilot 7 on "Cross-border Health Data Exchange Supporting Mobility and Accessibility". Consequently, Task 3.5 worked with a range of User Requirements (as depicted in the table below) that had been completed or could be considered as an advanced draft and which could represent the pilot topics.

Table 7: Review and integration of user requirements from SHAPES use cases

Pilot	Use case
PT1 - Smart Living Environment for healthy ageing at Home	
PT-01-001	Remote In-Home Wellbeing Monitoring and Assessment
PT-01-004	Robot to Support Older People to Live Independently and Remain Socially Connected
PT2 - Improving In-Home and Community-based Care	
PT-02-001	Monitoring of health parameters
PT-02-002	Community Interaction
PT-02-003	LLM CARE Healthcare System for Cognitive and Physical training.
PT3 - Medicine Control and Optimisation	
PT3-general	Supporting multi-morbid older patients
PT4 - Psycho-social and Cognitive Stimulation Promoting Wellbeing	
PT-04-002	Cognitive tasks
PT5 - Caring for Older Individuals with Neurodegenerative Diseases	
PT-05-001	Online information and training for informal dementia caregivers
PT-05-004	Virtual Patient Scenarios (VPS) – Mobile Virtual Patients (MVP)
PT6 - Physical Rehabilitation at Home	
PT-06-002	Gait rehabilitation

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The User Requirements as developed by these pilots have been mapped against the Platform Requirements as also detailed in Annex V. In those instances that requirements developed by Task 3.5 seemed to be aligned with the pilot's User Requirements this was detailed accordingly. In those situations that requirements from the pilots seemed to be of relevance for the functioning of the platform, a respective requirement was added to the platform requirements.

3.3.3 Online Workshops with the User Requirements Board

In total, two workshops have been implemented making use of White Boards and interactive approaches including the use of sticky notes and dots for commenting and prioritising the requirements that had been developed. The outcomes of the workshops are detailed in the sub-sections below.

3.3.3.1 Functional Requirements workshop

The Functional Requirements Workshop took place virtually on 1st December 2020 from 13:00-15:00 CET via *Teams* and the use of *Miro*.

The following organisations were represented in the workshop:

Table 8: Organisations participating in the Functional Requirements Workshop

#	Organisation
1	Fraunhofer INT (FhG)
2	Maynooth University (NUIM)
3	Northern Health and Social Care (NHSCT)
4	Clínica Humana (CH)
5	Associazione Italiana Assistenza Spastici Provincia di Bologna (AIAS)
6	EDGENEERING (EDGE)
7	Tree Technology SA (TREE)
8	Universidad de Castilla - La Mancha (UCLM)
9	Intracom Telecom (ICOM)

The main findings of the Functional Requirements Workshop are detailed below.

The Functional Platform Requirements derived for the four main dimensions were presented as a first step:

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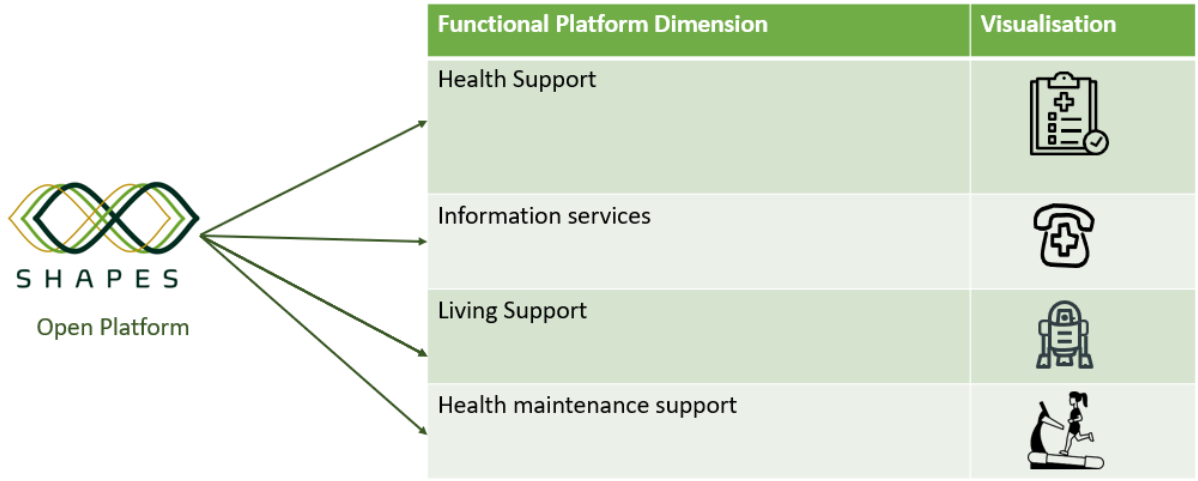

Figure 9: Functional Platform Requirements Dimensions

As a second step and to get an understanding of the relative importance of the requirements collected so far, participants were asked to rank the requirements per category in *Miro*, using a virtual "sticky dot" method. Two exemplary screen shots are depicted in the figures below.

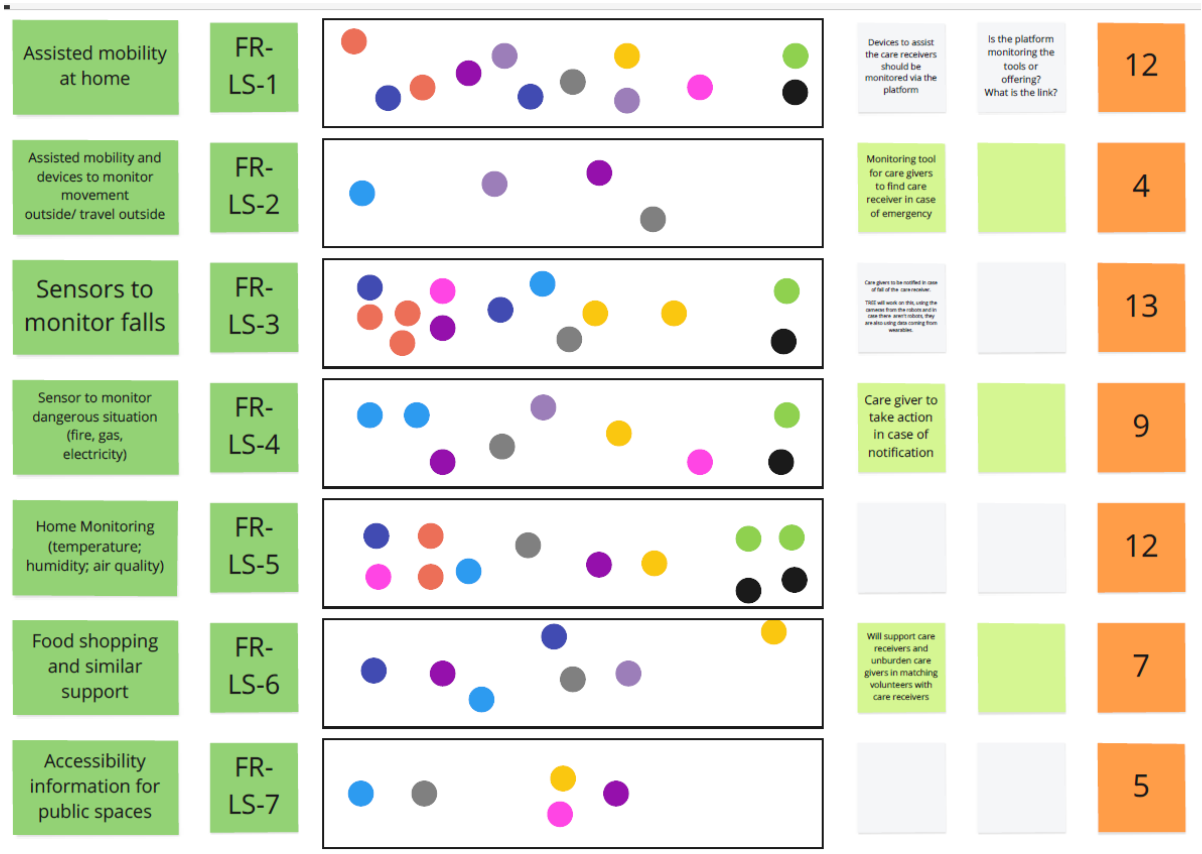

Figure 10: Example of the online Sticky-Dot Method to rank requirements

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Figure 11: Example of the use of online White Boards to receive qualitative feedback on the requirements

Each participant received several dots equalling the number of requirements per category. Participants could distribute the dots according to the relative importance of each requirement from 0 to all of the dots. In addition, participants were able to comment on each dimension after the distribution of dots to get some more qualitative feedback. A summary of each dimension is detailed below.

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Health support

Max. number of dots per requirement: 20; min. number of dots per requirements: 1

Assessment:

The most important functionalities relate to the collection, management and monitoring of health data and vital signs (17-20 dots). In addition to this, medication tracking (17 dots) and medication and clinical readings/ treatments reminder as well as predictive reports were seen as important functionalities (all 15 dots). Interestingly, nutrition, water and sleep tracking received less than 10 dots (7, 5, and 9 dots respectively). In contrast to this, measuring the perceived well-being ranked 12 dots. Finally, also the operation of a support centre (24/7) was ranked quite high (17 dots).

Comments:

This assessment was complemented by the comment that psychological well-being plays an important role and emphasis of the platform should therefore be put on creating community (with peers) and allowing for a playful way of interaction. This could relate for example to offering rewards or friendly competitions – such as the number of activities conducted in a week. The selection of "friends" in order to find motivation and communicate about it could be an alternative option. The overall vision of the platform is as a critical friend that helps you in all stages of ageing and functional decline was expressed.

In addition, more general information on healthy ageing should be made available via the platform, for example on where and how to receive (organisational, administrative and/or legal) support as well as tutorials on healthy habits. This should also relate to manuals and tutorials or guided tours on the platform itself for use – among others – in the implementation of the pilots. It was furthermore recommended to integrate general environmental, pollution and weather information as well as information about cooking or the TV programme of relevance for the older population in a certain area.

Call Center: centrally managed or local numbers provided through the platform?

Reminders/alerts system: can be linked to medication, nutrition, physical activity or social connectiveness. With respect to medication participants may be taking a large number of medications at different times throughout the day. They may only need/want one reminder per day or a reminder for one type of medication or a check box to say that they have taken all prescribed medication that day.

Vital signs: should be integrated into the dashboard on the patient.

Most of the suggestions fit the Health *Maintenance* Support dimension of the platform (see below) and will be included accordingly.

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Information Services

Max. number of dots per requirement: 24; min. number of dots per requirements: 0

Assessment:

The most important requirements were an easy-to-use access to information and navigation including communication services and dashboard function for health care professionals (21- 24 dots) including the allocation of tasks to health care professionals (12 dots). They were followed by the requirements to provide questionnaires to monitor the health-care related quality of life (15 dots). An important service should be the connection with peers and networks (12 dots) (see also comments above).

Information services are also closely linked with ethical and data protection related requirements on monitoring of one's own data including options to receive a copy or to easily delete it (12-18 dots).

Finally, the provision of information to different user groups such as training material for care providers (14 dots) or information for care receivers and informal carers, for example on legal aspects or social support mechanisms (17 dots) were ranked high. Finally, this aspect of the platform should also encompass training and intervention plans (12 and 8 dots respectively) as well as exercises and knowledge tests (10 dots). The latter aspect is closely linked with the comments under section 2.1. It should be considered also under aspects of making it playful/motivating (sometimes also known as gamification).

Comments:

It is important that any information provided via the platform is trustworthy and some examples could be selected for the pilots. In addition to this, users should be able to share their own experiences and knowledge. One functionality should hence be linked to the aim of linking individuals with others in similar situations (peers) and also integrating existing communication applications such as *Whats App*[18]. A platform forum as well as collective training/exercising might hence be useful. Potentially, information about community activities (depending on the business model and how delocalised would platform provider work) could also be useful to raise motivation and facilitate exchange with peers.

At the same time, the platform could also be used to integrate certification such as the European Care Certificate in the caregiver training[19].

[18] https://www.whatsapp.com/?lang=en (20.04.2021).
[19] More information can be provided by Evert-Jan Hoogerwerf.

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Communication channels between health providers, care receivers and care givers should differentiate between one-to-one or all-to-all communication.

Platform interfaces should be adaptable and enable users to hide aspects they do not need.

Interventions may need to be set by professionals if they involve specific treatments, medication, diet or physical activities.

Health Maintenance Support

Max. number of dots per requirement: 22; min. number of dots per requirement: 2

Assessment:

The most important functionalities under this category relate to the provision of exercises and the support in maintaining/increasing health literacy and dietary balance (22 and 21 dots respectively). They are followed by mood assessments and mental as well as relaxation exercises (all 7 dots).

Comments:

It was mentioned that health maintenance is linked with being active and not only about relaxation. Also, the needs of the older individuals vary broadly and many are still very active. This range in activity and fitness need to be reflected by the platform when offering health maintenance support.

Moods assessment: Ensure differentiation between mood and assessing clinical anxiety/depression as people may be identified as requiring immediate clinical intervention which would need 24/7 clinical support. In addition, "more than one mood assessment can be added per day" - it could be very useful to add a timestamp on these assessments, as it might clarify patterns helpful to finding solutions (eg. Social loneliness in early mornings with people who struggle sleeping, etc). On the contrary it was also mentioned that people might not want to share information on their moods.

Living Support

Max. number of dots per requirement: 13; min. number of dots per requirement: 4

Assessment:

The most important functionalities under this dimension encompass assisted mobility at home (12 dots) as well as sensors to monitor falls (13 dots) and home monitoring including for example air quality, temperature, etc. (12 dots) were ranked as most important functionalities. By way of contrast, assisted mobility outside and options to monitor outside movements were lowly ranked (4 dots).

Comments:

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Living support should be linked with (information on) transport services.

Click-and-pay services should be available.

Facilitated email programme could be useful. Many older people have difficulties in emailing and in general new digital innovations (e.g. home banking, etc)

Monitoring:

- Sensors for fire/fall etc ideally will trigger a text or call to an informal caregiver and alternatively to the emergency services.
- Monitor movement outside the house is highly intrusive.
- Monitoring home temperature and indoor air quality is relevant for enabling good living ambient
- How about monitoring social interaction? – Social connectedness as a wider concept is missing.

3.3.3.2 Ethical Requirements Workshop

The Ethical Requirements Workshop took place virtually on 13th January 2021 from 13:00-15:00 CET via *Teams* and the use of *Miro*.

The following organisations were represented in the workshop:

Table 9: Organisations participating in the Ethical Requirements Workshop

#	Organisation
1	Fraunhofer INT (FhG)
2	Maynooth University (NUIM)
3	Northern Health and Social Care (NHSCT)
4	Clínica Humana (CH)
5	LAUREA
6	EDGENEERING (EDGE)
7	Tree Technology SA (TREE)
8	Universidad de Castilla - La Mancha (UCLM)
9	Intracom Telecom (ICOM)
10	Members of Ethics board

The main findings of the Ethical Requirements Workshop are detailed below.

The four main functional dimensions were presented as a first step (see also figure 9 in the section above)

As a second step and to get an understanding of the relative importance of the requirements collected so far, participants were asked to rank the requirements per category in *Miro*, using a virtual “sticky dot” method. Therefore, each participant

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received a number of dots equalling the number of requirements per category. Participants could distribute the dots according to the relative importance of each requirement. The categories participants could select were “Low”, “Medium-Low”, “Medium-High” and “High”. The results are described in this order. In the following, the numbers stated behind certain criteria reflect the number of dots assigned to a respective category.

In addition, participants were able to comment on each dimension after the distribution of dots to get some more qualitative feedback. A summary of each dimension is detailed below.

Overall there were some fruitful general discussions about what to consider ethically relevant when creating the platform. The main concerns were raised when talking about data protection rights and gaining the trust of the users in general. One of the bigger challenges for the project will be to create tailor-made data consents and finding the balance between using/sampling too much information or not having enough information. Another challenge for the users will be to be able to see what information has been gathered about them and how they will be able to revoke or delete this information. These are substantial issues for gaining trust and eventually for potential users becoming comfortable enough to use the platform.

Health support

Max. number of dots per requirement: 14; min. number of dots per requirement: 0

Assessment: From an ethical point of view there were a lot of requirements that were seen as being of a critical nature or that tended to be of high relevance when looking at the results. One of the most critical issues were requirements concerning the health data collection and management (and sharing of) health parameters (0-0-9-3), the measuring of daily steps (1-1-8-1), measuring of daily exercises (0-0-10-1), sleep tracking (0-3-7-1), medication tracking (0-1-9-2), processing of health data/risk assessments risk plan (0-0-1-10), recording of the perceived state of well-being (0-0-8-3), Predictive Medicine (Predict risk of health events including decompensations in patients with heart failure, exacerbations of COPD, and hypo/hyperglycaemia in patients with diabetes. Using smart data analytics and predictive algorithms and Ambient Intelligence Health and Wellness Platform.) (0-0-2-7) and Appliances Monitoring (on/off; duration of use) (0-2-8-1).

Less relevant from an ethical point of view were the requirements that the platform should include tutorials and help cards regarding its use and the use of the devices connected to it and that a glossary of terms should be available (4-7-0-0). However, providing clear and understandable information on shapes and its services is essential ethical requirement. According to the workshop results, lower ranks were additionally received by the medical emergency alert system (0-7-2-2), track and record clinical device characteristics regarding maintenance/calibration (3-8-1-0), and SHAPES

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platform should be explicit about the benefits of its use (prompts, feedbacks, rewarding messages, etc.) (1-6-3-0).

Comments:

This assessment was complemented by qualitative comments by the participants. It was mentioned that monitoring in general is challenging and concerns not only privacy and data protection, but also touches on the question of human dignity. Another ethical question that was raised was that since life is risky, we have to choose which things are critical or not and it was suggested that there is a general issue of autonomy of the users – it depends strongly on the mental and physical state of health and the possibility of ignoring advice is critical.

There were also some discussions/remarks about legal restrictions that need to be considered: “Measuring and monitoring are issues that are easily privacy invasive despite good intentions or acceptable goals. Sharing health data is challenging - there might be legal constrains but it's also an ethical/practical challenge: how do we ensure that users understand what is shared etc. The lawful application of functionalities collecting health data may differ between EU countries. One example is the role of consent as a legal basis for processing health data. Article 9 of the GDPR gives Member States discretion to disallow consent as a basis for data processing.” Another participant stated some concerns that may arise with Northern Ireland leaving the EU: “With Northern Ireland leaving the EU I am unsure whether this will impact on data sharing/transfer.”

Another comment focused on the question on how to deal with possible hacking of the data and on how the data will be anonymised.

Some concerns about malfunctioning of the platform were also addressed, as an example it was mentioned that there is a risk that the medication reminder may not be accurate and could end up with the user taking the wrong medication. Predicative medicine poses questions in general: “how do we ensure that we're providing "right" predictions - who will provide those and to whom? Do we have controls to ensure that there's not wrong data used etc., how do we ensure that it is both compliant and ethical? In general, the issue of the trustworthiness of AI and data analytics and big data was questioned.

The question arose as to how it is will be defined as to who will have access to the data. Further, the capability to enter manual data may be important but will at the same time pose new challenges/question: who will enter the data (end users, professionals etc.) and how the quality and reliability of the data will be guaranteed.

Overall it was emphasized that the whole concept of collecting data from users has high ethical concerns, even though the individual requirements were rated rather low within the workshop.

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Information Services

Max. number of dots per requirement: 14; min. number of dots per requirement: 0

Assessment: Most of the requirements in the dimension of Information Services were rated with a rather low importance with regard to ethics. In this rather low rating, the following exceptions seemed to be more important: the requirement concerning Relevant care giver data: Age, educational degree, distance to reach care receiver, access to internet, technological skills (0-2-6-3); the Permission/access privilege management (2-0-1-7), the ability to remove the study completely or the ability to use data up until the point of withdrawal providing consent is provided (2-1-4-5); and that the text contents in the programme adapt to users' information (e.g. name, gender/ name, gender of the person being cared for). (0-0-2-8).

Comments:

Concerning Information services, it was discussed that privacy and personal data processing is one of the most challenging issues. Users must also have confirmation when they are removed from the platform and the platform must have a method for participants to withdraw consent and all their data from the system, these functions are considered as legal requirements. Any mental health information/contact details would need to be accurate and contemporaneous in case any users were in crisis and needed immediate support. Another aspect mentioned is the end-user's capability to understand, learn and use the service, which is an essential issue. Having said that, all aspects that help to make the service user friendly are important, even if those are legal requirements like the right to withdraw consent. These legal requirements were indicated as low risk for ethical concerns. Likewise, requirements that improve data protection such as privileged access management & logging requests should be treated similarly concerns regarding some requirements dealing with general information should be very low as well. The last thing mentioned was that non-market peer production and new roles of end-users in those networks are related to the moral division of labour and to end-user's new roles.

Health Maintenance Support

Max. number of dots per requirement: 14; min. number of dots per requirement: 0

Assessment:

The most important ethical requirement Mood ratings of x or lower should direct the users to relaxation and/or cognitive reframing lessons. (0-2-6-0). All other were voted with a low relevance.

Comments:

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In many cases, care professional may not need to have access to specific exercises performance, but only to averages. Another aspect that was mentioned was that care should be taken when monitoring mood. In cases where extremely low mood is determined a protocol may need to be developed to sign post help or medical referral. It was also emphasised that vocational wellbeing is important and that it is essential that SHAPES will also support this aspect of health.

Living Support

Max. number of dots per requirement: 14; min. number of dots per requirement: 0

Assessment:

None of the requirements in the dimension of Living Support were rated very high/or very low. The requirements with the highest votes were: Assisted mobility and devices to monitor movement outside/ travel outside (0-0-6-1); Assisted mobility at home (1-0-5-1); Sensor to monitor dangerous situation (fire, gas, electricity) (0-1-5-0). One requirement was rather inconclusive in its voting: Sensors to monitor falls (0-4-4-0)

Comments:

In the field of living support, it was mentioned that the relevance is on detecting the absence of activity/movement and not exactly on the activity or movement itself and that there would be a process set up if no movement is detected. Another aspect was that SHAPES should cover needs and wants related to coping at home and not only health issues, but at the same time accessibility should be supported, and the rights of people with disabilities must also be considered.

Overall, the workshop (and its results) also strengthened the exchange and collaboration with WP8. It led to the insight that Ethical Requirements need to be differentiated in terms of those relevant of the technical platform and those related to general or governance aspects. This aspect was stressed by D8.14 “Final SHAPES Ethical Framework”. The respective revised “Ethical Requirements for the SHAPES Technological Platform” have been integrated in the Requirements below.

3.3.4 Surveys

Since the technical, security and business requirements were all encompassing, they did not seem to fit online workshop formats. In addition, a larger number of experts with technical and business-related expertise were meant to be involved in the final specification of the requirements. Hence, two surveys were developed and implemented. The results are summarised in the sections below. The detailed results can be found in Annex VII. The summaries are depicted in section 3.3.4.1 and 3.3.4.2.

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In addition, a survey relating to the functional requirements was implemented by WFDB to review the needs of deafblind users. The results are detailed in section 3.3.4.3.

3.3.4.1 Technical and security requirements

In order to develop the survey, the security and technical requirements were shared with the leads of WP4 (ICOM) and WP5 (TREE) in the first instance for comments. Particularly in collaboration with WP4, inconsistencies and ambiguities were identified and deleted. Overlapping requirements were combined. The following requirements were included in the survey:

1. Platform should resemble technologies that older people use in their everyday lives, for example online banking.
2. Platform needs to be accessible by different user groups including disabled.
3. Platform should make information accessible per "least-clicks" rule; a double-menu (at the top and the side) should be used to navigate.
4. Ensure that data is protected, recoverable and attributable; Employ appropriate security technologies and access logs.
5. Create capabilities to identify potential personal data breaches and identification of personal data breaches.
6. Ensure that the IAM (identity and access management) can be used for limiting access to certain categories of personal data and the need to restrict access to certain data is taken into consideration in SHAPES architecture.
7. Password management: Provide a mechanism to deal with forgotten passwords/ issuing new passwords.
8. Create a process for executing data subject rights, i.e. provide information about the stored data per user, give central access to data, and allow for a centralised option to delete all data.
9. Ensure critical service continuity 24/7 (acceptable downtime 2%).
10. Allow and support the scaling up of tools, i.e. for example application within a whole country.
11. Allow for different levels of complexity of the platform; develop a modular approach.
12. Platform needs to be adaptable in terms of relevant content to be displayed and appearance, i.e. fond size, contrast, etc. by the user.
13. The SHAPES platform should be able to store and retrieve large amounts of meta-data.
14. System is continuously available even in case of disconnections from the Internet and lack of access to any cloud data centre.
15. Means to recognize platform components failure or other issues should be provided (event log).
16. Sensors and measurement devices applied need to be recognized/registered

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17. If the SHAPES platform or one of its sub-systems comes back online after scheduled or unscheduled downtime, the users should be able to see/do what they expect (system able to resume at the correct point).
18. Easy to conduct updates via the platform.
19. SHAPES should adopt and use open and interoperable standards on internal and external interfaces or isolate dependencies by design to support reusability and portability.
20. SHAPES should provide tools to simplify the installation of solutions.
21. Option to collect analytics referring to services usage (e.g. profiling of users and performance) for improvement.
22. Programme logos and the top of the page should have linking options to the landing page of the respective starting page/webpage.
23. Enable and support the exchange of information between different tools.
24. Allow for the use of mobile devices; Compatibility with IOS and android smartphones.
25. Facilitate mobile access to health documents.
26. Link with existing patient profiles.
27. Interconnecting patient data across communities.
28. Retrieve patient data.
29. Retrieve identities/profiles.
30. Recording and retrieval of privacy consents.
31. Exchange of documents.
32. Compatibility with different browsers to be determined.
33. Allow for key word search.
34. Health and social care needs of citizens in different conditions are not static but develop over time, as well as the response to changing care needs that the institutions might wish to provide; the platform should take this into account.
35. The different functionalities of the SHAPES platform should respond to the care ecosystem analysis that identifies the functions performed by the different actors.

Finally, the option to add additional requirements was inserted. The figure below exemplarily shows the survey template.

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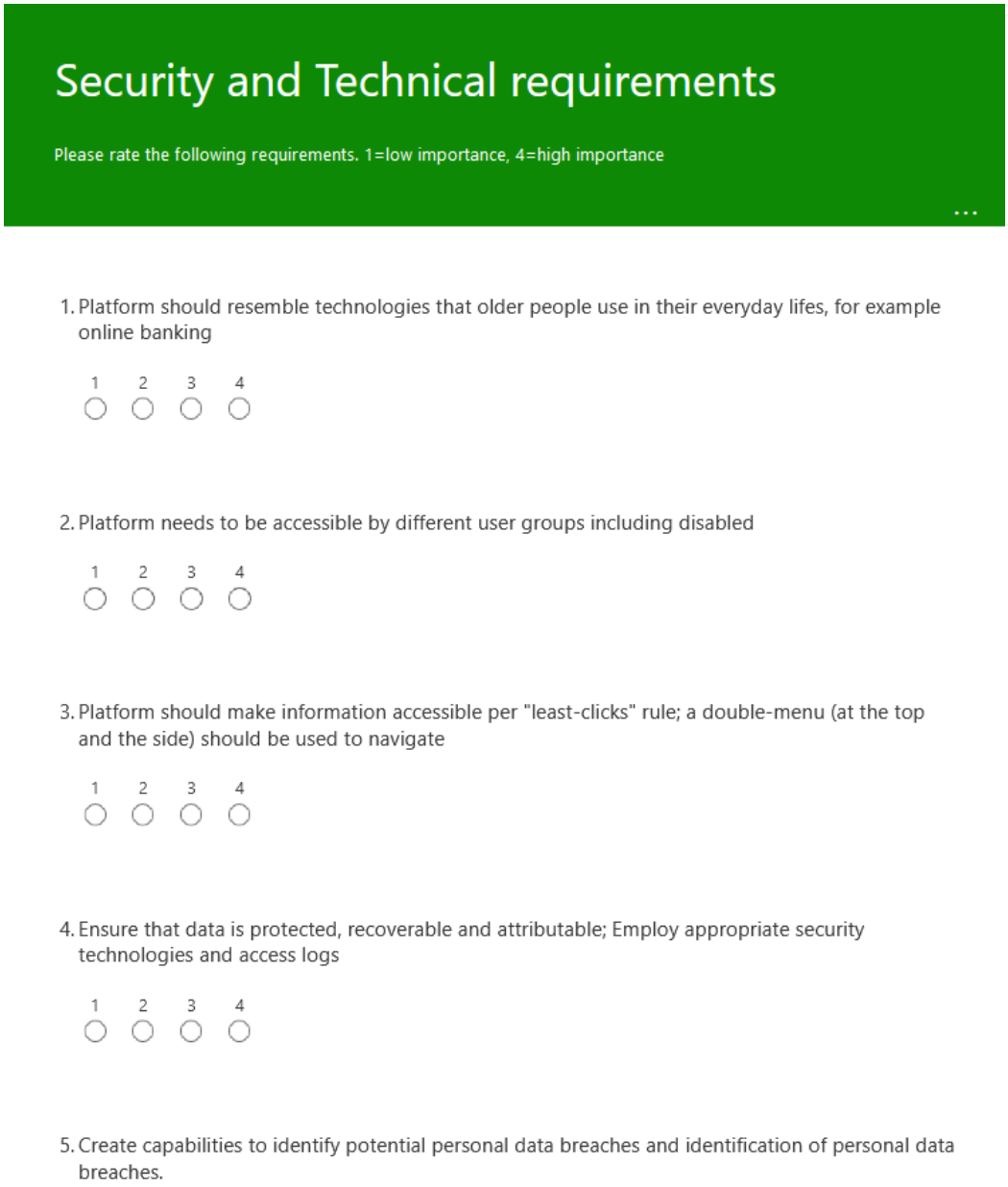

Security and Technical requirements

Please rate the following requirements. 1=low importance, 4=high importance

1. Platform should resemble technologies that older people use in their everyday lifes, for example online banking

1 2 3 4

2. Platform needs to be accessible by different user groups including disabled

1 2 3 4

3. Platform should make information accessible per "least-clicks" rule; a double-menu (at the top and the side) should be used to navigate

1 2 3 4

4. Ensure that data is protected, recoverable and attributable; Employ appropriate security technologies and access logs

1 2 3 4

5. Create capabilities to identify potential personal data breaches and identification of personal data breaches.

Figure 12: Security and Technical Requirements survey

The survey for rating the technical and security requirements was answered by 14 partners. For each requirement they could choose between numbers from 1 to 4, with 1 = low importance and 4 = high importance. There were 35 requirements to rank and one question for missing requirements. There were 8 requirements with an average above 3,5, 23 with an average between 3,5 and 3,0 and 4 below 3,0. The most important aspect, with a rating average of 3,92 was to ensure that data is protected, recoverable and attributable and to employ appropriate security technologies and access logs.

Other aspects with a high ranking were that there should be a mechanism to deal with forgotten passwords and that the platform is accessible by different user groups, including disabled users. The requirement with the least important rank had an average score of 2,92, which is still rather high. Those requirements were

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interconnecting patient data across communities, link with existing patient profiles and that the programme logos and the top of the page should have linking options to the landing page of the respective providers. As an additional requirement it was mentioned that SHAPES Digital solutions should be able to send alerts and notify the care givers when a care receiver is in a need of assistance.

The feedback received was integrated into the technical and security requirements.

3.3.4.2 Business requirements

In line with the Security and Technical Requirements, the list of Business Requirements has been coordinated with WP7 (EDGE). More specifically, the following list of requirements the SHAPES platform should include was circulated:

1. Shall adopt a customer logic (B2C and B2B) in its design and development.
2. Shall have its own Terms of Use and Services Policy.
3. Shall have its own Privacy Policy, observing applicable regulations, including the GDPR.
4. Should implement a customer support service.
5. Shall be cost-affordable based on the system's modularity and configurability.
6. Shall support various business models (e.g., direct sales, licensing, subscription, etc.).
7. Shall support multiple subscription models (e.g., free, standard, premium).
8. Shall have an online marketplace.
9. Marketplace shall support the registration of suppliers (supply) and of clients (demand).
10. Marketplace shall select its suppliers based on their offer's effectiveness, affordability and added value to the Platform.
11. Marketplace shall contribute to the Platform's monetisation (e.g., fee per transaction).
12. Marketplace suppliers shall abide and follow the SHAPES Platform's Terms of Reference, privacy policy and ethics.
13. Marketplace should encourage transparent competitiveness.
14. Marketplace should contribute to building economies of scale (e.g., create supply chains).
15. Marketplace should contribute to remove existing vendor locks.
16. Marketplace should contribute to the dynamics of local economies (e.g., aggregation of offers based on location and geographical reach).
17. Shall consider sustainability in its design and development (e.g., economic, financial, social and environmental).
18. Shall observe universal accessibility policies (e.g., consider public authorities role related to respective subsidies).
19. Should consider the adoption of standards in its design and development, from a business sustainability perspective.

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20. Should foster corporate social responsibility (e.g., contribute to societal goals of a philanthropic, charitable or activist nature, by supporting volunteering or ethically-oriented practices).

The business requirements survey finally also offered the option to add additional requirements. The figure below exemplarily shows the survey template.

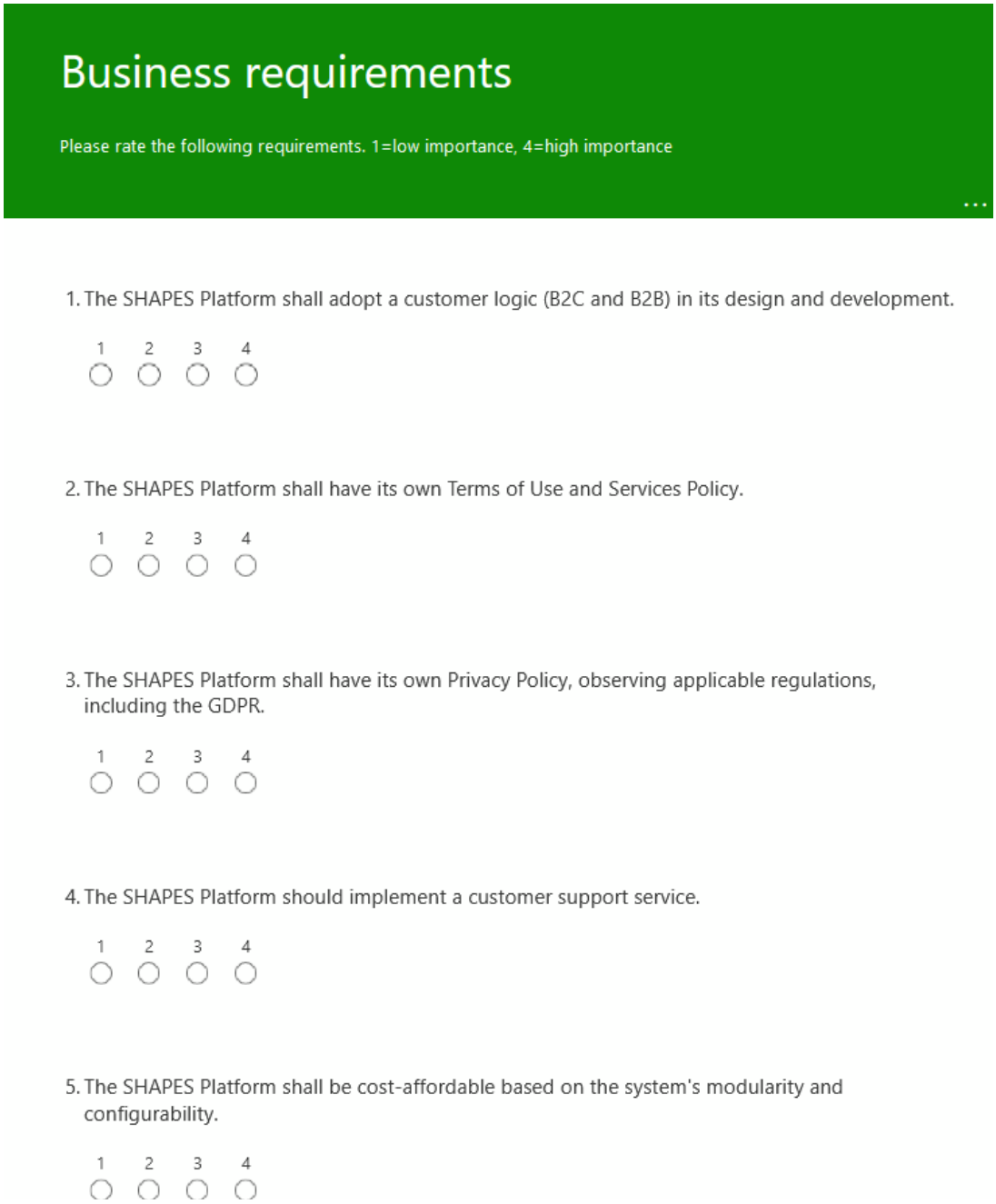

Figure 13: Business Requirements survey

The survey for business requirements was build up similarly. There were 20 rating questions and one blank field which participants could use to suggest additional requirements. 17 Experts answered the survey, however, one of the requirements was only rated by 16. Two requirements were rated with 3,88, 9 between 3 and 3,5, 8 less

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than 3 and one less than 2,5. With an average of 2,41 the requirement that the SHAPES Platform Marketplace shall contribute to the Platform's monetisation (e.g., fee per transaction) is rated the lowest. The two with the highest average rating (3,88) describe that the platform shall have its own

Terms of Use and Service policy as well as its own Privacy Policy, observing application regulations and the GDPR. Additionally, it was mentioned that the SHAPES Platform should provide an open API and use interoperability standards (e.g. IHE) so that other platforms are able to connect with it in a secure manner. Additionally, it was mentioned that the SHAPES platform needs to be taught from proficient tutors for older adults to improve adaptability.

The feedback received was integrated into the technical and security requirements.

3.3.4.3 The World Federation of the Deafblind (WFDB)

The following input has been gathered through an online survey and completed by persons with deafblindness from Norway (5) and the Czech Republic (7). This is a summary of the responses.

Out of 12 responses, 5 (CZ-4, NO-1) identify themselves as female and 7 (CZ-3, NO-4) identify themselves as males. They are all claim they are 65 years or above and live at home.

What kind of health support systems would be useful for you to maintain a healthy and independent life in your home?

- Personal assistance and digital solutions that could inform me of my health status.
- Interpreter to follow up doctors' visits.
- Social contact and meetings with peers with the same disability and sharing troubles and solutions, assistants providing sport and physical activities to keep me fit, somebody or some tool for reminding to take the right medicine at the right time.
- Regular help and control about taking medicine and control of blood pressure.
- Receive regular information about medical procedures, regular medical controls, vaccination by local doctors, social workers concerned and awareness about dual sensory disability.
- Regular blood pressure measurement, person or activities helping with senile dementia.
- Collecting and recording data about health situation.
- Measuring blood pressure and reminding medications

What kind of information services would be useful to you for you to maintain a healthy and independent life in your home?

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- Data systems that can enable me to communicate with health personnel.
- Interpreter
- Continuous telephone and personal contacts.
- Bilateral and more accessible contacts on healthcare workers, social workers and organisations concerned about sensory disability.
- Better access and contact with healthcare workers and doctors by telephone communication awareness about dual sensory disability.
- Regular telephone calls and e-mail information.
- Tools to communicate with healthcare professionals.
- Video conferencing tools to communicate with health workers

What kind of living support systems would be useful to you to maintain a healthy and independent life in your home?

- Systems that can notify on movement and an emergency button that can be activated.
- All kinds of sensors to secure life and health important.
- Sensor for monitoring the weather outside and the recommendations what to take and what should be aware of, suitable indoor lighting, occasional help and support from health and social workers and assistants, girlfriend.
- Versatile personal assistant/guide.
- Assistant/Guide for daily support and social contact.
- Guide dog, assistant.
- Sensors for monitoring and detecting falls and dangerous situations.

What kind of health maintenance systems would be useful to you to maintain a healthy and independent life in your home?

- Training programs that can be carried out and followed up by for instance my physiotherapist.
- Interpreter-guide important for physical/mental health
- More possibilities for sport and physical activities under control and guiding by physically fit assistant who is trained and knows what to do, physiotherapist.
- Occasional physiotherapeutic care, massages, spa with personal assistant/guide.
- Person/Assistant/Guide who would provide mental support, relaxation and home physical activities and walks.
- Person or assistant who would provide and motivate me to relaxation and physical exercises; modified trails for walks.
- Providing mental, physical and relaxation exercises.
- Physical and relaxation exercises

3.3.5 Feedback from end-user interaction

An interim version of requirements detailed in section 4 has been presented to a range of end-user to receive their feedback on existing requirements and potential need for

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additional ones. To facilitate this interaction, a simplified visualisation was developed with the intention to make them easy to grasp and understand for a lay-person. The figure below depicts the visualisation that was developed for the Health support category under the Functional Requirements:

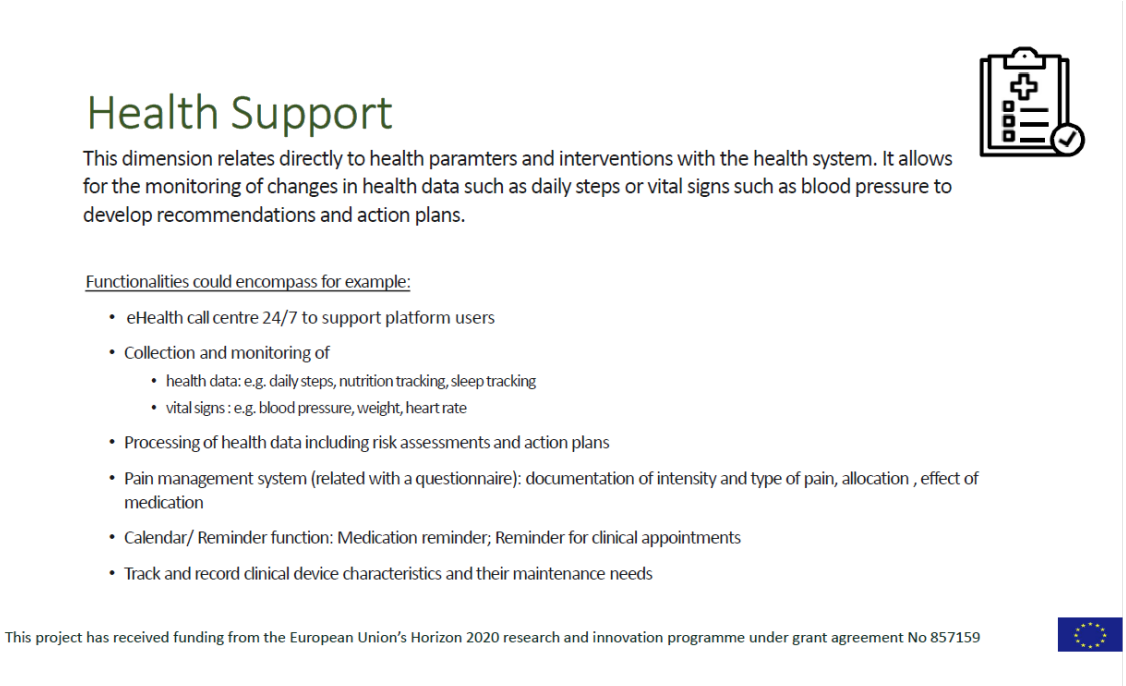

Figure 14: Example of requirements visualisation for discussion with end-users.

3.3.5.1 Feedback from interviews conducted by Omnitor

Feedback on the technical and functional requirements was collected with the end users that work in SHAPES. One detailed feedback on the derived requirements came from two interviews conducted by Omnitor in Sweden. One interviewee worked for the Östermalm district administration in Stockholm City and was concerned with elderly care, the other interviewed person was a project manager under the district administration of Enskede-Årsta-Vantörs. The feedback of both interviewees in depicted in the section below per requirements dimension and sub-section.

Most of the remarks had already been included in the requirements. Feedback requiring the creation of additional requirements have been summarised at the end of section 3.3.5.1.

Functional requirements

Health support

First interview:

It was stated that the requirements on eHealth call centre 24/7 to support platform users and the collection and management of health data such as daily steps, nutrition tracking, sleep tracking or vital signs (such as blood pressure, weight, heart rate) could both be very interesting for the individual. Nevertheless, it was also mentioned that in Sweden for example there would need to be a permission from the individual user, that his or her data can be transferred the data away from the "physical" house. Thus, there would be the need to register which permits have been given by the user.

Second interview:

Another interviewed person stated that the eHealth call centre 24/7 to support platform users is very good, because increased availability is always good. This requirement is prioritized.

Another requirement that would need to have a consent is the medication reminder/reminder for clinical appointments. The same applies to the tracking and recording of clinical device characteristics and their maintenance needs. It was stated that the collection and management of health data such as daily steps, nutrition tracking, sleep tracking or vital signs would be very interesting and is prioritized but everything needs to be controlled and authorized by the individual. If this is not the case the function is not good and should not be prioritized (e.g. if the data goes directly to the doctor or the family without authorization). Overall, the function 'Medication reminder; Reminder for clinical appointments' is very good and it already exists for the individuals who are demented. It was prioritized by the interviewed person.

The processing of health data including risk assessments and action plans is nothing new but still a good function. There are medical records that are open to all care providers, so it is a good function even though it is not new.

The functional requirement 'Track and record clinical device characteristics and their maintenance needs' could be good to track a clinical device such as a respirator. It was prioritized.

Information services

First interview:

In regard to the requirement "Communication systems like a video conferencing tool (to complete medical reviews)", the first interviewee stated that it needs to be clear what type of communication systems and if this communication is between the caregiver and another caregiver or between caregiver and caretaker. If this communication takes place between caregivers and care recipient this is a function that can be prioritized due to its importance.

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The functional requirement: “Easy to use dashboard and information and summary for health care professionals; ability to allocate tasks to specific professionals” is already available and is not a huge priority from the interviewees point of view.

With regard to the “Information services (for care receivers and providers) with peer groups” it was stated that there is an existing network available for rehab. Both digital and physical. And with regard to the information on mental and physical health this was prioritized as very important by the interviewed person as well.

The requirement concerning training material & exercises (for all older adults, care receivers, care providers, etc.) is a prioritized function from this person’s point of view. At the same time, there is the need to specify the exercise to the specific individual.

Second interview:

The second interviewed person thought that “Communication systems like a video conferencing tool (to complete medical reviews)” could be useful and gave as an extra note that there have been many fraud attempts in Sweden which have created many sceptics (applies to an older individual, but not for people that are 55 years). Fraudsters find out private information about the individual to be deceived and could for example pose as friend to a relative who needs help. This has created a situation where elder people are afraid to even answer the phones.) But the person also suggested that a video could create security if it is someone you recognize. Thus, it is prioritized.

Referring to the function “Easy to use dashboard and information and summary for health care professionals; ability to allocate tasks to specific professionals” can certainly work. At the same time there is a need for technical training among caregivers. Still the person does not give it a high priority.

The person stated that ‘Information services (for care receivers and providers): peer networks’ could be interesting and that Information services (for care receivers and providers): mental and physical health’ could be difficult to interpret, depending on the person and that health is different for every person.

With regard to the requirement “Training material & exercises (for all older adults, care receivers, care providers, etc.)” the interviewed person explained that the Swedish national public television broadcaster has a program called ”Träna med Sofia (Translated: Training with Sofia)”, which is very popular among older individuals. So, this function was prioritized but the users have to be digitally connected.

Living support

First interview:

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The first interviewed person stated that the assisted mobility at home (e.g. robotics linked with platform) was a prioritized function and that it is interesting and fun.

The requirement 'Assisted mobility and devices to monitor movement outside/ travel outside' was prioritised as well and it was mentioned that this provides increased security.

The functional requirement 'Sensors to monitor to detect falls & dangerous situation (fire, gas, electricity)' was seen as very important because it provides increased security as well. It was also stated that it may be interesting to let the user prioritize which specific function is most important to them: fire, gas, electricity or falling even if the assumption is that the tracking of falls is most important.

Home Monitoring (temperature; humidity; air quality) is good to have from the first interviewees point of view even though this is not prioritized.

The requirement to have food shopping and similar support to be provided/conveyed via the platform already exists in Sweden since COVID so it has a lower prioritization.

With regard to the Information on the accessibility of public spaces (e.g. for handicapped) it was stated that this service had been requested before but that this matter is very complex. Due to the timeframe of SHAPES this was given a lower prioritization but in general would be a prioritized function,

<u>Second interview:</u>

The person did not prioritize the function "Assisted mobility at home (e.g. robotics linked with platform)" because they do not think that a robot should be a replacement for other human beings and cannot replace social gatherings/functions. Still of the robots can help the user with digital services, this should be prioritized.

The person also stated that "Assisted mobility and devices to monitor movement outside/ travel outside" can be good, if it is not surveillance. Smartwatches with functions such as positioning, and steps are prioritized.

The function "Sensors to monitor to detect falls & dangerous situation (fire, gas, electricity)" is prioritized as well, because there are far too many accidents and elderly people are often overrepresented in fire accidents.

The function "Home Monitoring (temperature; humidity; air quality)" can be good. Advantages could be used to check poor ventilation. Still, the person did not think this should have a huge priority.

Food shopping and similar support to be provided/conveyed via the platform was absolutely prioritized by the interviewed person. He/she also explained that during the

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pandemic, many volunteered, with services like shopping and delivering food, but if you can do that by yourself and get home deliverance such function should be very good.

Another very important function is the 'Information on the accessibility of public spaces (e.g. for handicapped') this should be absolutely prioritized from the interview person's point of view.

Health maintenance support

First Interview:

The requirement "Provision of mental & physical exercises (available in text and audio)" and the requirement "Relaxation / cognitive reframing exercises" could be put together as one point from the interviewees point of view. Both are being prioritized because they give the user the opportunity to do something fun and exciting.

The mood assessment function could be tricky, because it would need to be a function that does not need too much effort from the user. Thus, it has not been prioritized but this could change depending on how it works.

The requirement "Support dietary balance" is already available today and can be reused. It is a good function from this person's opinion.

The requirement "Improve health literacy" could be expanded/could be more detailed when including the WHO's recommendations on it.

Second interview:

The functional requirement "Provision of mental & physical exercises (available in text and audio)" is prioritised because it is a good service that would allow more persons to move or workout.

The interviewed person was unsure about the "Mood assessment function" and did not understand the requirements "Relaxation / cognitive reframing exercises".

With regard to the function "Support dietary balance" the interviewed explained that the Swedish elderly administration (Äldreförvaltningen) has created an 'e-health app' that's already available, provides tips for food and meals, but does not know how many people use this. Hence, it's a 'half-priority'.

The person suggested that the "Improve health literacy" could be merged with "Support dietary balance" above. They also explained that every district in the city of Stockholm has a dietitian, who gives a lecture on meals, constantly working to improve knowledge. Hence, they thought it is a good and prioritized function.

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New functional requirements derived from the interviews:

Health support: Collection of the permissions of the user on data transfer.

Living support: The function to find company for example a lunch buddy or someone to talk to – to break loneliness.

Technical requirements

Nearly all technical aspects were voted as important and prioritized by the persons interviewed by Omnitor. The details can be seen in the following chapter structured by the technical requirements.

Scalability: This is a requirement that the platform must deliver from the interviewee's points of view. It was rated as prioritized and important by both.

Adaptability: Platform needs to adaptable in terms of relevant content to be displayed and appearance, i.e. font size, contrast, etc.: This is important and prioritized as well. Different aspects have to be considered, for example, green/gray cataracts. Was prioritized by both interviewees.

Availability: 24/7; System is continuously available even in case of disconnections from the Internet and lack of access to any cloud data centre: this is important, but it is depending on the function, for example fall detection is probably more important than video. Was prioritised by the second interviewee.

Reliability: The integrated SHAPES framework as well as the SHAPES solutions should be able to perform with great stability and cohesion: This was rated important by both interviewed persons. The encryption that does not fall under the Data Management Act.

Recoverability: System should be able to take up operations again after scheduled or unscheduled downtime (frequent backups): this was voted important in both interviews. Also, the question was raised if it is possible to see when there is a schedule drift stop? Finally, the reminder for stop could be a good function, which provides options if something urgent should happens.

Accessibility: Platform should resemble technologies that older people use in their every-day-lives, for example online banking. Platform needs to be accessible by different user groups including disabled: The first interviewee emphasized that Shapes needs to have a forward perspective. The technology knowledge or tech savviness varies very much across the target groups, for example, the 50s and 60s have different technical knowledge. Hence, the platform needs to be able to target different user groups. The second interviewee also stated that the platform cannot be 'too' advanced and it should be as easy as possible. The keyword is 'user-friendly'.

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Maintainability: Platform should be easy to update and to maintain: the less the end users' needs to do, the better.

Usability: Easy to use services and content: is voted as important by both persons, because otherwise no one will use the platform.

Interoperability This was prioritised by both interviewees as well. Enable and support the exchange of information between different tools and platforms; enable the use of mobile devices. One interviewee emphasized that the users prefer smartphones, so the priority should be on iPads and smartphones.

Additional notes:

Many older individuals may not be used to use a computer, even a sign-in function can be a problem. This problem does not only apply to older individuals, many who work in health care are also "digital illiterates". This poses quite a big challenge. Lack of e-identification (how to use an electronic identification system) is a common cause.

Östermalm creates a platform (physical meeting space) called DigiCenter, which work overall aspects of digitisation. It creates a place to offer iPad courses, beginner/advanced computer courses, Information/training for staff/elderly who are not compatible with digital technologies/ solutions and similar. It offers for example guidance on how online banking works.

New technical requirement derived from the interviews:

Accessibility: the platform needs to be able to target different user groups.

3.3.5.2 Workshop with AGE Taskforce on Dignified Ageing (Task 4.2)

This interaction aimed at discussing the requirements with the target group of care receivers and informal care givers. A session could be integrated into a workshop that was held by task 2.4 (AGE Platform) on 4th February 2021. This session dealt with presenting the SHAPES platform and discussing of particular functionalities with the AGE Taskforce on Dignified Ageing representatives. Many fruitful inputs and points were addressed within this session and will be summarized within this chapter.

Some questions were brought up during the discussion:

How can integrated care fit into the SHAPES project and into the platform? Who will pay for the service once the project is over? Will social services pay for this, how can this be ensured when facing the challenge of having different regulations and systems within the countries?

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Another question that was posed during the workshop was the question on how the SHAPE platform will be linked with other care platforms and how the data can be shared/how these systems can be interoperable.

Another issue mentioned was the language and possible problems concerning the understanding. Hence, language diversity should be considered when creating the platform.

When discussing possible requirements in the area of living support the participants mentioned that the platform should include information about public transportation.

On a more general note, it was mentioned that the security of the system needs to be ensured and tested. Also, the platform should be usable on tablets as an app and with linkages to community and house issues. There was an overall discussion about (digital) technology in general: It was emphasised that information technology itself is not the answer to all the challenges that older people face. The users need to know how to use the technology beforehand. Under normal circumstances today not all of the older persons have access to digital tools.

Another factor that was addressed was that the support of the vocational well-being is essential for the platform.

Thus, the derived requirements for the platform are:

Functional requirements:

- The platform should also be usable for integrated care.
- Platform should be acceptable for older persons.
- Platform should take diversity of users into account.
- Platform should integrate the possible different languages of its users.
- Information about public transportation should be included.
- Vocational well-being needs to be supported by the SHAPES-platform.
- The platform needs to be affordable.

Technical requirements:

- The platform needs to be interoperable with other platforms.

3.3.5.3 Olomouc University, Social Health Institute

Representatives from the Social Health Institute of the Olomouc University engaged with potential SHAPES platform users. Most of the doctors to which they tried to reach out to have been extremely busy with patients due to Covid-19. However, platform requirements could be discussed with social workers working with older adults. These shared the following feedback that was integrated into the requirements:

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- **Call centre**: sometimes older adults are not able to communicate clearly with the doctors, therefore and “interim contact” (family member/informal caregiver) should be linked with the profile
- **Notification function**: could also relate to reminders to stand up/walk
- **Temperature assessment** (monitoring in the house): Older adults tend to lose focus of the temperature surrounding them and may stay in too cold environments; minimum temperatures should hence be set.
- **Support in "translating" information** provided by doctors; making sure the user understands his/her conditions
- **Medication reminder**: should also remind of asking for the prescription by the doctor, buying it at the pharmacy (as the medication tracker knows when the user is taking their pills, they can have the overview)
- **Exercise support**: videos should be available
- **Social network "check"**: Daily check whether the person has been in touch with someone during the day (friend, family, neighbour etc.)
- **General appearance**: make sure that written content and buttons are readable (not too small) and that not too many buttons can be pushed

In addition, interviews could be conducted directly with older adults: In terms of home monitoring, older adults aged 74-85 were very open to use sensors in their home. They were not worried about cyber security. They liked the idea of the platform but expressed the need for training on how to use it. They also expressed the wish for doctor appointment reminder that would remind of an appointment for the other day including the documents/things to take with them (as they tend to forget) and to provide additional information on how to get there (if it is a new doctor, new specialist) since they get easily confused in new environments e.g., at hospitals.

3.3.6 Requirements derived from personas

Some new requirements concerning the different areas could also be derived from the personas that have been developed in WP2. Mainly the information about ‘unmet needs’ and the information about the personas ‘events, issues, personal concerns and technology’ were used for deriving these requirements:

- It was important for many of the personas to have a reminder of what medications to take because many of them have to take several different medications. Thus, the functional requirement concerning medication tracking/reminder seems to be very important.
- Some of the personas also have the issue of staying in contact with their community or with other persons who share the same interests (a bingo group for example), so it would be helpful if the platform could also be used as a matching tool to find other persons with similar interests to digitally spend time or digitally build a community with them. This would break the loneliness many

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of the personas are afraid of and it would keep them pleasantly and cognitive occupied.

- Some of the personas have trouble understanding technology, so there is a need to integrate easy tutorials, use understandable language within the platform, maybe implement a training tutorial on how to use the platform and its functions.
- For some of the personas the requirement to be monitored concerning health data such as heart rate or monitoring of steps is important.
- Some personas want to be more informed about their diseases and its consequences, so it could be helpful to integrate medical, reliable information.
- For some personas it might also be great to be able to contact their real-life family and friends through the platform.
- The integration of online peer groups with the same or similar disease could be good.
- For some personas the monitoring of their own health status would be very helpful.

Many of these requirements have already been identified before and are included in the user requirements.

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4 Overview of SHAPES Platform Requirements

Building on the 1st and 2nd iterations of the Deliverable and the insights derived through the actions specified above, the following requirements have been defined. This overview is based on an Excel sheet that was iteratively developed throughout Task 3.5 and shared with the project consortium.

Overall, the SHAPES platform requirements encompass four dimensions:

- Functional Requirements (FR)
- Legal and Ethical Requirements (LER)
- Security and Technical Requirements (STR)
- Business Requirements (BR)

Each dimension is detailed in a separate section below.

Each dimension is differentiated into several sub-categories (e.g. Health Support) which are then followed by the actual requirement (Number-coding) and further specifications (Letter-coding). For example, “Health data collection and management (and sharing) of health parameters” is the 3rd requirement under the Health Support (HS) dimension under the Functional Requirements (FR) and coded as follows: FR-HS-3. It is further specified in sub-requirements such as “Measuring daily steps (to measure daily activity)” (FR-HS-3a) or “Sleep tracking (duration, begin/end; day time sleep; wake ups at night)” (FR-HS-3d).

The ranking of the importance of the requirements was visualised as follows:

Table 10: Colour-coding system related to the ranking (relative importance) of platform requirements

Ranking	**Colour code**
High/For the Legal and Ethical Requirements: Mandatory based on law	
Medium/For the Legal and Ethical Requirements: Essential for ethical sustainability and quality of SHAPES	
Low/ For the Legal and Ethical Requirements: Optional	
Already considered by a digital solution in the context of a pilot	
Not applicable (n.a.): requirements is optional and might also require further discussion	

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4.1 Functional Requirements (Coding: FR)

Sub-categories	Requirement	Coding	Ranking	General comments
General (Coding: G)	Overall vision of the platform should be "a critical friend"	FR-G-1	High: users should feel comfortable in using it.	
	Platform should facilitate integrated care	FR-G-2	High: overall project aim	
	Different languages need to be provided	FR-G-3	High: platform needs to be applicable to different country contexts.	
	Vocational well-being needs to be supported	FR-G-4	High: users should feel comfortable in using it.	
Health support (Coding: HS)	An eHealth call centre to support platform users needs to be available 24/7 for all users.	FR-HS-1	Low: Needs to be ready if platform takes up operations; technical contact needed for pilots though	Call Centre needs to be available for all user groups; sometimes older adults are not able to communicate clearly with the doctors, therefore and “interim contact” (family member/informal caregiver) should be linked with the profile
	The platform should include tutorials and help cards regarding its use and the use of the devices connected to it. Also a glossary of terms should be available.	FR-HS-2	High priority: should be a core part of the platform.	Link with ProACT project. This should be top priority in various languages; and the SHAPES platform should encourage peer-to-peer training (as example see Senior academy in Dresden); older adults demonstrating how to use these applications rather than engineers imagining the best way to do this. Ergonomics of the monitor needs to be considered (size of buttons, lights,…) .

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	Health data collection and management (and sharing) of health parameters	FR-HS-3	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021	WP2.1 Data suggests that a wrist monitor or a smart watch with an emergency function is the most tolerated form of sensor. Functionality relevant for all user groups; they will be involved in collection and monitoring; -Healthcare professional/service user/carer ability to review historical data which may be asked for at review appointments should be integrated into the patients dashboard. It is crucial that privacy and data protection as well as aspects of human dignity are considered for all health data related aspects and functionalities. Legal bases with respect to the sharing of data might vary between Member States. Users need to be able to understand the consent (what is shared and with whom) and need to be able to revoke the consent for all data easily. Aspects of malfunctioning - e.g. the mediaction reminder - can cause serious problems
	Measuring daily steps (to measure daily activity)	FR-HS-3a	Is part of digital solution under PT-01_001, PT-02_001, and UC-PT3-001	Steps should be counted using a pedometer, preferably one being worn on the wrist (it can be worn permanently). Assessment against target values.
	Measuring daily exercises (time of exercise, intensity, objectives)	FR-HS-3b	Medium: Is part of digital solution under PT-01_001 and PT-02_002	Understanding whether it's individual or collective, with other people? How best to motivate them to do it (friendly competition?) - this decision will require different technical solutions! This could be measured using fitness tracker. There is one connected to eHealthPass (Garmin Vivosmart 4) and another to eCare (Xiaomi Mi 3 Band)

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	Measuring Water uptake	FR-HS-3c	Is part of digital solution under PT-02_001	PT-02-001 will use a Smart drinking bottle. The bottle measures how much has been drunk and reports this to an app. Supplemented by manual entries (e.g. if the older person buys something to drink outside the home or prepares a cup of tea) the daily fluid intake can be documented.
	Sleep tracking (duration, begin/end; day time sleep; wake ups at night)	FR-HS-3d	Is part of digital solution under PT-01_001, PT-02_002 and PT-03_001	fitness tracker on the wrist or a mobile phone app), sleep can be recorded. E.g. sleep-app "Sleep Better" (Runtastic) or similar. Record sleep quality (how often awake/REM phases etc) and give tips on how to improve sleep the following day/evening
	Nutrition tracking	FR-HS-3e	Is part of digital solution under PT-02_001	To understand the social context of meal it is important to make the technology flexible enough to motivate people to eat right, whether they eat alone or in a group. It is important to understand the cultural and social context of meal preparation and cooking. See WP2.1 for examples. Tracking meals is very complex and requires a lot of discipline, which makes the implementation massively more difficult. Since the test persons are in home care, one could assume that many at least get their lunch from external delivery services such as "meals on wheels". Together with these providers, a system could be designed in which the older persons could simply scan a barcode with their cell phone and the nutritional information from the delivery services would be taken over immediately. The system needs to allow the individuals to indicate whether everything was eaten or only partially / saved for later / shared with others. For many, breakfast and dinner are part of a fixed routine, which means that ready-made standard meals to choose from a “menu” can be provided, making tracking much easier (such as: porridge / white bread with jelly / yoghurt

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				/ etc..). Solution: ehealthPass (from GNO) has a module for nutrition intake monitoring
	Medication tracking	FR-HS-3f	Is to some extent part of digital solution under PT-03_all	
	Monitoring of vital signs (weight, temperature, blood pressure, blood glucose, bioimpedance, heart rate, blood oxygen level, etc.)	FR-HS-3g	Is part of digital solution under PT-01_001, PT-01.004, PT-03-all,	Sometimes, the parameter is measured more than once, if the first one gives an abnormal value. If values are collected automatically, a functionality to detect 'final' value would be nice. This may be specialist-dependent though. An example would be 'blood pressure', if it is high a second measure is recommended after 10-15 min of resting. Maybe it's difficult to implement as a functionality, as 'guidelines' are different at each site and a standard protocol does not exist.
	Capability to enter manual data	FR-HS-3h	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2020	Relevant for example if there is a problem with a blood pressure device data transmission but device has displayed the results to allow these to be entered in manually; Tracking who is inserting data this should be possible (device | older person | caregiver).

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	Processing of health data: risk assessments, action plans	FR-HS-4	High (platform priority): should be available for 3rd/4th pilot cycle, i.e. August 2021	SHAPES should inquire not only into chronic conditions but also about general make-work of care-giving so that people can live independently and well attended at home over time (coordination and communication); where is risk assessment kept, how is it created and by whome? Who will update it and who has access? It should be a high priority to look at the coordination of the different actors in care (formal and informal) that operate the data; it is important to think about the long-term care network with everyone involved in that process (WP2.1); how can informal exchanges and conversations that take place between the many people in different roles be made accessible in a shared digitised record; -- this is a big issue and might benefit from a meeting for further inquiry (WP2.1 and 3.5) Functionality relevant for all user groups; development of action plans based on FR-HS-2; The concept behind the design of the ProACT system and its end user interfaces should be that of the "supportive friend" that helps to cope with chronic conditions and the impact of these conditions on wellbeing and quality of life, including the overcoming of barriers.
	Recording the perceived state of well-being / self-assessment tool	FR-HS-5	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021 Applied in PT01_001 and PT02_001	Recording a stable (good) health status will make older individuals feel safer and thus more secure in pursuing daily activities ("feel-good effect"). Using Ambient Intelligence Health and Wellness Platform Related questionnaires applied to PT3-001 and PT6-002 (Clínica Humana); Weekly questionnaires will be applied in PT01_001 making use of three-stage smiley-scale

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	Help for dealing with legal issues (e.g. advanced care plans; end-of-life care)	FR-HS-6	Low: Needs to be ready if platform takes up operations; optional	This functionality will mainly connect health care professionals and administrations with the care givers
	Medication reminder / support Reminder for clinical readings/appointments Reminder to stand up/walk	FR-HS-7	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021	Functionality needs to be managed by health care professionals in terms of defining target parameters; care receiver and care givers to monitor the actual medication intake; medication participants may be taking a large number of medications at different times throughout the day. They may only need/want one reminder per day or a reminder for one type of medication or a check box to say that they have taken all prescribed medication that day. Alert can also be linked to medication, nutrition, physical activity or social connectiveness. Functionality should also remind of asking for the prescription by the doctor, buying it at the pharmacy (as the medication tracker knows when the user is taking their pills, they can have the overview) Reminder for appointments should also remind older individuals about the documents/things to take with them (as they tend to forget) and to provide additional information on how to get there (if it is a new doctor, new specialist)
	Pain management system	FR-HS-8	Low: Needs to be ready if platform tkaes up operations; Integration into pilots needed though	WP2.1 Data suggests that a wrist monitor or a smart watch with an emergency function is the most tolerated form of sensor. Pain management will involve all actors and be closely linked with FR-IS-1 on communication services and medication support (FR-HS-5 above)

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	Medical emergency alert system	FR-HS-9	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021 Applied in PT3-001	WP2.1 Data suggests that a wrist monitor or a smart watch with an emergency function is the most tolerated form of sensor. Medical emergency alert will in the first place involve the care receiver, care givers and health care professionals it will be linked with health data surveillance (FR-HS-2) and sensors to monitor falls (FR-LS-3) monitoring of physiological parameters remotely e.g. blood pressure, heart rate, blood glucose, oxygen saturation; integration of personalised normal ranges for clinical values e.g. blood pressure, heart rate, blood glucose, oxygen saturation against which values are assessed and alarm is issued in case of breaching the ranges Categorised alert system e.g. red/amber/green
	Track and record clinical device characteristics regarding maintenance/calibration, make, model number	FR-HS-10	Low: Needs to be ready if platform takes up operations	Can provide information to all actors about devices used in the past.
	SHAPES platform should be explicit about the benefits of its use (prompts, feedbacks, rewarding messages, etc.)	FR-HS-11	Low: Needs to be ready if platform takes up operations	Link with ProACT project. Ergonomics of the monitor needs to be considered (size of buttons, lights,…) .

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	Predictive Medicine (Predict risk of health events including decompensations in patients with heart failure, exacerbations of COPD, and hypo/hyperglycaemia in patients with diabetes. Using smart data analytics and predictive algorithms and Ambient Intelligence Health and Wellness Platform.)	FR-HS-12	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021	
	Appliances Monitoring (on/off; duration of use)	FR-HS-13	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2022	
Information services (Coding: IS)	Easy to use communication systems	FR-IS-1	Low: Needs to be ready if platform takes up operations	This functionality should connect all actors and allow the care receiver an easy interaction e.g. with doctors or care givers; it should be linked with the monitoring of health data. Communication channels between health providers, care receivers and care givers should differentiate between one- to- one or all- to- all communication. Privacy and personal data processing is one of the most challenging issues. Bilateral and more accessible contacts on healthcare workers, social workers and organisations concerned about sensory disability.

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				Ergonomics of the monitor needs to be considered (size of buttons, lights,…)
	Video conferencing to complete medicines reviews (Remark: check inhaler technique)	FR-IS-2	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021 Applied to PT01_003	Connecting all actors Assessing/Monitoring the use of technologies by an adapted video conferencing version. Link with/develop reimbursement systems recognising e-consults as work. To build on the momentum that the Covid-19 crisis has provided for these systems.
	Voice and chat interaction	FR-IS-3	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021 Applied to PT01_004	Use of chatbots is an option
	Provide questionnaires to monitor health-related quality of life, medicines adherence, symptoms etc	FR-IS-3	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021	Questionnaires would be issued by health care professionals to assess the health status of a patient Clínica Humana is currently working on a questionnaire that is completed regularly for monitoring purposes as well as a questionnaire that is linked with other data (parameters) and launched if these parameters change PT01_001 also applied weekly questionnaires based on a three-stage smiley scale
	Allocate tasks to specific healthcare professionals through the dashboard and mark as 'ongoing', 'complete', 'further follow-up required' or ability to leave notes e.g. handovers/updates	FR-IS-4	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021	This function mainly facilitates health care professionals

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	Scheduling of specific tasks for different users (care receiver, care giver, etc.)	FR-IS-4a	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2022	Could be used to organise the pilots
	Provide motivation/encouragement sentences to the care receiver: These set of sentences are to be provided on a regular basis or based on the values of other data, completion of tasks, etc.	FR-IS-4b	Low: Needs to be ready if platform takes up operations	
	Easy to navigate dashboard for care receiver	FR-IS-5	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2020	Option to store preferences, personalise the use
	Easy to navigate app/dashboard for service user/carer to review	FR-IS-6	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021	This service will mainly support the care giver/care receiver relationship
	Relevant patient data: Age, gender, degree of dependence, individual top three challenges	FR-IS-6a	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2022	
	Relevant care giver data: Age, educational degree, distance to reach care receiver, access to internet, technological skills	FR-IS-6b	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2023	

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	Caregiving data: type of care, duration and frequency of care Relevant caregiving data: delivery, number of caregivers, relationship	FR-IS-6c	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2024	
	Include fields of metadata that define the origin of a value	FR-IS-6d	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2022	The structure depends on the type of data. For example, PT3-001 will ask “the year of diagnosis of your heart failure condition”. The answer may be confirmed by 1) a medical report; 2) told by care receiver (who can be more or less sure); 3) told by the caregiver (again, who can be more or less sure)
	Information space: information about health in general, certain diseases, provision of peers and networks Should relate to care receivers and (informal) care givers	FR-IS-7	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021	Should connect care receivers with peers and networks of interest to exchange and socialise; It is important that any information provided via the platform is trustworthy Should also relate to the explanation of the platform and its functionalities: "How to..."
	Manuals and tutorials or guided tours on the platform itself for use – among others – in the implementation of the pilots.	FR-IS-7a	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2022	
	Information on where and how to receive (organisational, administrative and/or legal) support as well as tutorials on healthy habits	FR-IS-7b	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2023	

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	General environmental, pollution and weather information but also information about cooking or the TV programme of relevance for the older population in a certain area	FR-IS-7c	Low: Needs to be ready if platform takes up operations	Should be linked with recommendations on and what to take and one should be aware of (particularl relevant from a deafblind perspective)
	Option to find contacts - e.g. to share the lunch break with to break loneliness	FR-IS-7d	Low: Needs to be ready if platform takes up operations	Potentially also related to finding peers
	Information about activities in the community	FR-IS-7e	Low: Needs to be ready if platform takes up operations	
	Information about support services (mental and physcial help) Should relate to care receivers and (informal) care givers	FR-IS-8	Low: Needs to be ready if platform takes up operations	Will provide a guide for care receivers to the services provided under FR-HM-1.
	Availability of games and gamification approaches (friendly competitions)	FR-IS-9	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2020	This could for example relate to the number of activities conducted per week.
	Reminder/suggestions for games/activities	FR-IS-9a	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021	

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	Create logs for personal data (e.g., who has seen/modified personal data and when).	FR-IS-10	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021	All data changes/views should be retrievable. SHAPES should inquire not only into chronic conditions but also about general make-work of care-giving so that people can live independently and well attended at home over time (coordination and communication); where is risk assessment kept, how is it created and by whome? Who will update it and who has access? It should be a high priority to look at the coordination of the different actors in care (formal and informal) that operate the data; it is important to think about the long-term care network with everyone involved in that process (WP2.1); how can informal exchanges and conversations that take place between the many people in different roles be made accessible in a shared digitised record; -- this is a big issue and might benefit from a meeting for further inquiry (WP2.1 and 3.5)
	Permission/access privilege management	FR-IS-10a	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2022	Should record who has access to what and when. Multi-level permissions overall>pilot level>site level and different stakeholder groups clinicians/service users/caregivers /inspectors/admin/service providers/technical partners etc.
	Option of withdrawal from a pilot/ the platform	FR-IS-11	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2022	
	Leave the study completely or the ability to use data up until the point of withdrawal providing consent is provided	FR-IS-11a	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2023	

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	Allow the data subject to request a copy of the information held about them	FR-IS-11b	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2024	If participants take part in <1 pilot there will need to be a mechanism to link data/IDs and reduce duplication.
	Provision of training material for care providers	FR-IS-12	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021	Integrate certification such as the European Care Certificate in the caregiver training
	Program with reliable, comprehensive and clear information in a web portal which can be accessed any time/anywhere using a desktop/laptop/smartphone or tablet.	FR-IS-12a	Is part of digital solution under PT-05_001	
	Program with feasible/uncomplicated strategies ('How-to') to facilitate the practical care of a person (with dementia) covering multiple activities of daily living (e.g. eating and drinking; dressing/undressing; bathing/personal care; toilet care, etc).	FR-IS-12b	Is part of digital solution under PT-05_001	

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	Program with feasible/uncomplicated strategies ('How-to') to manage the psychological and behavioural changes in the person with dementia (e.g. aggression, depression, anxiety, sleep difficulties, repetitive behaviour, wandering, etc).	FR-IS-12c	Is part of digital solution under PT-05_001	
	Appraise and validate the main persona achievements/acquired knowledge and strategies. Offer immediate feedback on answers given to exercises to increase the main persona engagement with exercises, reduce errors and minimize 'test anxiety'. Offer feedback in an easy to understand manner (colour scheme: red for wrong; green for correct) plus comprehensive feedback (justification/explanation on why an answer might be more or less appropriate).	FR-IS-12d	Is part of digital solution under PT-05_001	
	Allow for an adaptation/personalisation of the training intervention plan	FR-IS-12e	Is part of digital solution under PT-05_001	

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	Offer guidance on the most important issues on dementia and dementia care by suggesting core lessons in the program by default to all new users, which can be performed or not according to his/her final choice.	FR-IS-12f	Is part of digital solution under PT-05_001	
	Offer a simple way of keeping track of the lessons completed; a star icon marks lessons added to a plan and a check icon marks lessons already concluded	FR-IS-12g	Is part of digital solution under PT-05_001	
	A printout module is available to print personalized booklets of the sessions mirroring the user learning process.	FR-IS-12h	Is part of digital solution under PT-05_001	
	Integrating existing communication applications such as *WhatsApp*.	FR-IS-13	Low: Needs to be ready if platform takes up operations; technical contact needed for pilots though	
	Platform forum for participants to exchange about certain topics	FR-IS-14	Low: Needs to be ready if platform takes up operations; technical contact needed for pilots though	

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	Option to train/exercise jointly	FR-IS-15	Low: Needs to be ready if platform takes up operations; technical contact needed for pilots though	
	Support in "translating" information	FR-IS-16	Low: Needs to be ready if platform takes up operations; technical contact needed for pilots though	Should support older individuals in understanding information provided by doctors; making sure the user understands his/her conditions
	Social Network Check	FR-IS-17	Low: Needs to be ready if platform takes up operations; technical contact needed for pilots though	Daily check whether the person has been in touch with someone during the day (friend, family, neighbor etc.); double check against Ethical Requirements and GDPR regulations!
	Matching information services and offers to user needs	FR-IS-18	Is part of digital solution under PT-02-002	Making use of machine learning
	Offering summaries of news articles from online news sources with a link to the original article	FR-IS-19	Is part of digital solution used in PT2-003	Making use of AI technology
	Provision/brokering of interpreters to follow-up doctors vistsis or assitants for sport etc.	FR-IS-20	Low: Needs to be ready if platform takes up operations	Particularly relevant from a deafblind perspective
Health maintenance support (Coding: HMS)	Mental exercises for care receivers and care providers	FR-HM-1	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021	Offers digital mental trainings to care receivers; developed by health care professionals; potentially monitored by care givers

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	A mood assessment function is available for self-completion with ratings and free text assessment options. A mood graph/mood history is displayed to represent mood progress over time.	FR-HM-1a	Is part of digital solution under PT-05_001	Ensure differentiation between mood and assessing clinical anxiety/depression; extremely low mood may need to be developed to sign post help or medical referral People might not want ot share information about their mood. For FR-HM 1a-f ethnographic assessment should be done because of the relationship of that data to the life-world of older people this is beyond the scope of WP2.1.
	Mood ratings of x or lower should direct the users to relaxation and/or cognitive reframing lessons.	FR-HM-1b	Is part of digital solution under PT-05_001	
	Various different relaxation exercises are available with options based on muscular relaxation and on imagery-based relaxation.	FR-HM-1c	Is part of digital solution under PT-05_001	
	Relaxation exercises instructions are available in text and audio.	FR-HM-1d	Is part of digital solution under PT-05_001	
	More than one mood status can be added per day.	FR-HM-1e	Is part of digital solution under PT-05_001	
	The scale for mood assessment should discriminate the numbers from 1 to 10.	FR-HM-1f	Is part of digital solution under PT-05_001	

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	Communication through an interface showing pictures/words with associated sounds, that the user can use to communicate needs/feelings when not able to speak / move adequately	FR-HM-1g	Is part of digital solution under PT2-003	Particular needs of deafblind people should be taken into account additionally
	Use of customizable communication cards	FR-HM-1h	Is part of digital solution under PT2-003	
	Ability for the caregiver to customize mental exercises' difficulty level	FR-HM-1i	Is part of digital solution under PT2-003	
	Ability to select music to listen to/ videos to watch on their own, even when there are mobility restrictions	FR-HM-1j	Is part of digital solution under PT2-003	
	Physical exercises	FR-HM-2	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021	Offers digital physical trainings to care receivers; developed by health care professionals; potentially monitored by care givers
	Exercises should reflect different levels of fitness	FR-HM-2a	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2022	
	Exercises support videos	FR-HM-3	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2023	Explanation videos on the use of the exercises
	Support in maintaining good dietary balance; health literacy	FR-HM-4	Medium: should be available for 3rd/4th	Target values and recommendations are developed by health care professionals; platform should match them with dietary habits (either sensors or manual indications)

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			pilot cycle, i.e. August 2021	
	(Deafblind) Interpreter-guide and assistance for exercises/relaxations is important for physical/mental health	FR-HM-5	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2022	
Living support (Coding: LS)	Assisted mobility at home	FR-LS-1	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021	Needs and wants with respect to living support should be assessed in the first place Devices to assist the care receivers should be monitored via the platform
	Assisted mobility and devices to monitor movement outside/ travel outside	FR-LS-2	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021	Monitoring tool for care givers to find care receiver in case of emergency; it needs to be kept in mind that this intervention is very intrusive.
	Sensors to monitor falls; issuing of alarms	FR-LS-3	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021	Care givers to be notified in case of fall of the care receiver. TREE will work on this, using the cameras from the robots and in case there aren't robots, they are also using data coming from wearables.
	Sensor to monitor dangerous situation (fire, gas, electricity)	FR-LS-4	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021	Care giver to take action in case of notification
	Home Monitoring (temperature; humidity; air quality)	FR-LS-5	Is part of digital solution under PT-01_001	Older adults tend to lose focus of the temperature surrounding them and may stay in too cold environments; minimum temperatures should hence be set.

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	Food shopping and similar support	FR-LS-6	Low: Needs to be ready if platform takes up operations	Will support care receivers and unburden care givers in matching volunteers with care receivers Particularly for deafblindness also: assistants for daily support
	Accessibility information for public spaces	FR-LS-7	Medium: should be available for 3rd/4th pilot cycle, i.e. August 2021	
	Information about (public) transport shoud be made available	FR-LS-8	Low: Needs to be ready if platform takes up operations	
	Click-and-pay services should be available	FR-LS-9	Low: Needs to be ready if platform takes up operations	
	Monitoring of social interaction	FR-LS-10	n.a.	This was suggested in the context of a workshop and relates to the need for social connectedness that is essentialand should be kept in mind when thinking about healthy ageing. However, it may need some additional Ethical Review and particular consent from the affected individuals.

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4.2 Legal and Ethical Requirements (Coding: ET)

The Legal and Ethical Requirements table follows the same structure as the other requirements sections. However, under WP8 a number of additional aspects relating to the implementation/consideration of the mentioned requirements have been identified and are hence detailed under the "General Comments" column. The meaning of the column "Responsibility after the project" and "Processes" are detailed in the table below.

Table 11: Explanations on General comments related with Legal and Ethical Requirements

Responsibility after the project	Explanation
Governance	SHAPES IT-governance, clinical governance, health and social care governance, data governance and corporate governance (see SHAPES Governance Model (D3.5 and D3.6)
Service Provider	Stakeholder providing the service
Market Place	SHAPES market place (to be defined as part of WP7)
Processes	**Explanation**
User joins	New end user joins SHAPES/selects new services
User uses	End-user uses SHAPES services
User leaves	End-user stops using SHAPES services
Service joins	New service provider joins SHAPES
Service leaves	Service provider leaves SHAPES
Service development	Services are developed (with end-users)
Platform development	The whole SHAPES integrated care platform & concept is developed

In addition to the specific platform requirements listed above, it is essential that he SHAPES Platform and its implementation including the integration of digital solutions take general ethical requirements as formulated by WP 8 into consideration.

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Sub-category	Requirement	Coding	Ranking	General comments			
				Responsibility during the project	Responsibility after the project	Processes	More information in D8.4 sections
Platform Requirements (Coding: PT) (in distinction from more general requirements)	Ensure equal and non-discriminatory access to technology and its support services by using well-designed user interfaces, instructions and authentication.	LER-PT-1	Essential	WP2, W3, WP6, WP7, WP9?	Marketplace, Service provider, Governance	Service joins, Service development, Platform development	Rights, Disabilities, AI Ethics, Privacy & DP, Lifelong Learning
	Consider cultural diversity of users; for example, create avatars that represent different genders and cultures and let the user choose what to use. (TBD)	LER-PT-2	Mandatory	WP2, WP3, WP6	Marketplace, Service provider, Governance	Service joins, Service development, Platform development	Bioethics, AI ethics, Cybersecurity
	Create functionalities for the end-user to switch off/on various sensors and services whenever she/he want to do it.	LER-PT-3	Essential	WP2, WP3, WP6	Marketplace, Service provider	User joins, Service joins, Service development, Platform development	Disabilities, Capabilities, Lifelong Learning
	Data subject rights: right of access – provide a self-service portal where the data subject can get access to his/her data.	LER-PT-4	Essential	WP6, WP8	Service provider		Rights, Ethics of Care, Capabilities

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	Data subject rights: right to rectification – ensure that the data can be corrected in all places (incl. storage).	LER-PT-5	Essential	WP2, WP3, WP4, WP5/D5.1	Marketplace, Service provider	Service development, Platform development	Rights, Persons with disabilities, Digital inclusion, Lifelong learning
	Data subject rights: right to be forgotten – build capabilities for deleting personal data.	LER-PT-6	Essential	WP2, WP3, WP5 (5.1)?, WP6	Marketplace, Service provider	Service development, Platform development	Disabilities, Digital inclusion, Lifelong learning
	Data subject rights: right to restriction – build a capability for restricting data processing.	LER-PT-7	Essential	WP2 (use cases), WP4, WP5, WP6, WP7	Marketplace, Service provider	Service development, Platform development	Capabilities, Division of labour
	Data subject rights: information provided to third parties – create a functionality to get information about the third parties to whom data has been disclosed as part of robust data mapping and flows.	LER-PT-8	Essential	All WPs and Deliverables	Marketplace, Service provider	Service development, Service joins, Platform development	Rights, Disabilities, Terminology
	Data subject rights: right to data portability – create a capability to transmit data to the data subject/third party in a structured, commonly used and machine-readable format.	LER-PT-9	Essential	WP3, WP6, WP8	Governance? Marketplace? Service provider	Service development, Service joins, Platform development	Rights, Caregivers, Sustainable development

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	Data subject rights: right to object: 1) ensure that the information about automated decision-making can be given to the user (the data subject) before the process starts; 2) create the capability to prevent the data subject's data to be part of profiling if a data subject has objected to profiling.	LER-PT-10	Optional	WP5			Sustainable development, Covid and SHAPES
	Data protection principles: storage minimisation – ensure that there are technical capabilities to erase or anonymise personal data after the relevant data retention period. Ensure that data will be removed from all systems. Define automated functions if this is possible.	LER-PT-11	Essential	WP2, WP3, WP4, WP5, WP7, WP8, WP9			Policy
	Data protection principles: accuracy – ensure that the source of the data is recorded.	LER-PT-12	Mandatory	WP3?, WP 4 (4.5)?, WP5 (5.5, 5.7?), WP7, WP8	Governance? Marketplace? Service provider	Service joins, Service development, Platform development	Rights, Capabilities, Sustainable development, AI Ethics, Lifelong learning

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	Legal basis: a) ensure that there are sufficient capabilities for asking consent as part of the service and that the consent is documented properly (obligatory); b) build up a repository where consents can be collected centrally (optional – to be defined if it brings value to SHAPES).	LER-PT-13	Mandatory	WP4, WP5, WP6	Governance? Marketplace? Service provider	Service joins, Service development, Platform development	Privacy & DP
	Create traceability capabilities for personal data; data mapping/data flows.	LER-PT-14	Mandatory	WP5, WP6	Governance? Service provider	Service joins, Service development, Platform development	Privacy & DP, Data processing description and DPIA (appendix)
	Automated decision-making: Ensure that there's a capability to re-direct the decision to a manual process.	LER-PT-15	Mandatory	WP6, WP5	Governance? Marketplace? Service provider	Service joins, Service development	Privacy & DP
	Privacy by design and by default: implement needed privacy enhancing technologies.	LER-PT-16	Mandatory	WP4, WP5, WP6	Governance? Marketplace? Service provider	Service joins, Service development, Platform development	Privacy & DP
	Personal data breach: create capabilities to identify potential personal data breaches	LER-PT-17	Mandatory	WP6	Governance Service provider	Service joins, Service development, Platform development	Privacy & DP

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	Technical and organisational security measures: ensure that users' access can be limited to certain categories of personal data and the need to restrict access to certain data is taken into consideration in SHAPES architecture.	LER-PT-18	Mandatory	WP6	Governance? Marketplace? Service provider	Service joins, Service development, Platform development	Privacy & DP
	Keep logs for personal data (who has seen/modified personal data and when).	LER-PT-19	Mandatory	WP6, WP7	Marketplace Service provider	Service joins, Service development, Platform development	Privacy & DP
	Deploy the functionalities related to the trustworthy AI guidelines.	LER-PT-20	Essential	WP4, WP5	Governance Service provider		Cybersecurity
	Utilise the AI solutions also to provide self-diagnosis of the SHAPES's security and other issues.	LER-PT-21	Essential	WP4, WP5	Governance Service provider		Cybersecurity
	Deploy the functionalities related to cybersecurity	LER-PT-22	Essential	WP4, WP5	Governance Service provider		Cybersecurity
	Follow the WCAG 2.1. Standards and Universal Design principles in designing and implementing process. Perform formative, summative, and continuous evaluations. Test throughout the project lifecycle and any time new	LER-PT-23	Essential	WP4, WP5	Governance Service provider		Cybersecurity

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	content is added or code is updated.						
	Ensure the platform usage by using assistive technology (screen magnifiers, text-to-speech, colour combinations with high contrast etc.)	LER-PT-24	Essential	WP3, WP4	Governance Service provider		Cybersecurity

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4.3 Security and Technical Requirements (Coding: STR)

Initially, Security and Technical Requirements had been dealt with as separate requirements dimensions. However, since many overlaps existed, the categories were merged and specified based on collaboration with WP 4 and the survey described in section 3.3.4 above.

Sub-categories	Requirement	Coding	Ranking	General Comment
General (Coding: G)	SHAPES Digital solutions should be able to send alerts and notify the care givers	TS-G-1	High: ensure interoperability of services	
	Platform should be easy to use and provide a playful way of interaction	TS-G-2	High: platform will not be used if not supporting a playful way of interaction.	
Accessability (Coding: AC)	Platform needs to be accessible by different user groups including disabled (exchange with Accessibility Board)	TS-AC-1	High: the principle of total conversation needs to be followed for an inclusive development and application of the platform	Platform needs to follow principles of total conversation, i.e. provide text, voice and sign language and their real-time transfer. Total conversation enables citizens to communicate with audio, video and text in real-time which gives citizens with disabilities equal access to, for example, emergency services. The citizen can also share vital information (Exact location and language preferences). For example, an application was developed to allow Amazon Alexa to respond to sign language. SHAPES Partner Omnitor applies the concept. VidAsor Project (Videoassistance and accompaniment for deaf seniors) can be a good example - for more information look into D3.8.

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	Platform should resemble technologies that older people use in their every-day-lives, for example online banking	TS-AC2	Very high: platform will not be used if not easy to use	This will make it more likely that they will use it.
	Platform should make information accessible per "least-clicks" rule; a double-menu (at the top and the side) should be used to navigate	TS-AC-3	Very high: platform will not be used if not easy to use	
Data Protection (Coding: DP)	Ensure that data is protected, recoverable and attributable; Employ appropriate security technologies and access logs including consent processes	TS-DP-1	High: Platform needs to be GDPR conform	
	Create capabilities to identify potential personal data breaches and identification of personal data breaches	TS-DP-2	High: Platform needs to be GDPR conform	
	Ensure that the IAM (identity and access management) can be used for limiting access to certain categories of personal data and the need to restrict access to certain data is taken into consideration in SHAPES architecture.	TS-DP-3	High: Platform needs to be GDPR conform	

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	Password management: Provide a mechanism to deal with forgotten passwords/ issuing new passwords	TS-DP-4	High: Platform needs to be GDPR conform	
	Create a process for executing data subject rights, i.e. provide information about the stored data per user, give central access to data, and allow for a centralised option to delete all data	TS-DP-5	High: Platform needs to be GDPR conform	
	Recording and retrieval of privacy consents	TS-DP-6	High: Platform needs to be GDPR conform	Use for example: - BPPC (Basic Patient Privacy Consent) - Consent Document or "Patient Privacy Consent Acknowledgment Document"
Scalability (Coding: SC)	Allow and support the scaling up of tools, i.e. for example application within a whole country	TS-SC-1	High: Platform needs to stay flexible and should be able to operate at different levels	
	Allow for different levels of complexity of the platform; develop a modular approach	TS-SC-2	High: Platform needs to stay flexible and should be able to cater for different needs	At an individual level, the SHAPES platform should be able to display its services at different levels of complexity, allowing people to get gradually used to the system. Link with ProACT project
	Sensors and measurement devices applied need to be recognized/registered	TS-SC-3	High: Platform needs to operate with a range of external devices and services	

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Adaptability (Coding AD)	Platform needs to be adaptable in terms of relevant content to be displayed and appearance, i.e. font size, contrast, etc. by the user	TS-AD-1	High: Platform needs to meet clients needs	Users should be able to hide aspects they do not need.
	Health and social care needs of citizens in different conditions are not static but develop over time, as well as the response to changing care needs that the institutions might wish to provide; the platform should take this into account	TS-AD-2	High: Platform needs to meet clients needs	
	The different functionalities of the SHAPES platform should respond to the care ecosystem analysis that identifies the functions performed by the different actors	TS-AD-3	High: Platform needs to meet clients needs	
Capacity (Coding: CP)	The SHAPES platform should be able to store and retrieve large amounts of meta-data	TS-CP-1	High: Platform needs to meet clients needs	
Availability (Coding: AB)	Ensure critical service continuity 24/7 (acceptable downtime 2%)	TS-AB-1	High: Platform needs to be reliable	

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	System is continuously available even in case of disconnections from the Internet and lack of access to any cloud data centre	TS-AB-2	High: Platform needs to be reliable	
	Means to recognize platform components failure or other issues should be provided (event log)	TS-AB-3	Medium	SHAPES should provide means (such as: activities logins, monitoring interfaces, etc.) that can provide: • information about important events, • warning about system functionality degradation, • failure of one functionality, component or whole SHAPES platform. SHAPES should be able to monitor the external interfaces as well as internal failures, changes on these interfaces can cause degradation or failure of SHAPES functionalities.
Reliability (Coding: RB)	If the SHAPES platform or one of its sub-systems comes back online after scheduled or unscheduled downtime, the users should be able to see/do what they expect (system able to resume at the correct point)	TS-RB-1	Medium	
	There should be a notification to stop working in case of technical problems.	TS-RB-2	Medium	
Maintainability (Coding: MN)	Easy to conduct updates via the platform	TS-MN-1	Medium: Due to the multitude of services, their update should be easy to maintain.	

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	Option to collect analytics referring to services usage (e.g. profiling on users and performance) for improvement	TS-MN-2	Medium	
Useability (Coding: US)	SHAPES should provide tools to simplify the installation of solutions	TS-US-1	Medium	
	Programme logos and the top of the page should have linking options to the landing page of the respective starting page/webpage.	TS-US-2	Medium	User might get lost and/or want to come quickly come back to the beginning.
	Allow for key word search	TS-US-3	Medium	
Interoperability (Coding: IO)	SHAPES should adopt and use open and interoperable standards on internal and external interfaces or isolate dependencies by design to support reusability and portability	TS-IO-1	High: Due to the multitude of services to be offered via the platform data exchange with and between multiple tools must be facilitated	Use for example FHIR® Fast Health Interoperable Resources. FIHR is a next generation standards framework created by HL7. FHIR combines the best features of HL7's Version 2, Version 3 and CDA® product lines while leveraging the latest web standards and applying a tight focus on implementation. More information: http://www.hl7.org/implement/standards/fhir
	Enable and support the exchange of information between different tools	TS-IO-2	High: Due to the multitude of services to be offered via the platform data exchange with and between multiple tools must be facilitated	
	Allow for the use of mobile devices; Compatibility with IOS and android smartphones	TS-IO-3	Medium: Use of mobile devices for the platform should be possible	Facilitate IHE MHD (Mobile access to Health Documents). This IHE Profile defines a simple HTTP interface to an XDS like environment, highly targeted to mobile devices. It defines transactions to:

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				● Submit a new document and metadata from the mobile device to a document receiver; ● Get the metadata for an identified document; ● Find document entries containing metadata based on query parameters; ● Retrieve a copy of a specific document. More information at: http://goo.gl/X6q64e
	Facilitate (mobile) acces to health documents	Ts-IO-4	Medium: (Mobile) access to halth documents should be possible	Can be facilitated for example by IHE MHD
	Link with existing patient profiles	Ts-IO-5	Medium: Use of mobile devices for the platform should be possible; interlink with PDGm seems useful	Interlink for example with with PDQm (Patient Demographics Query for Mobile). The Patient Demographics Query for Mobile (PDQm) Profile defines a lightweight RESTful interface to a Patient demographics supplier (identical to IHE PDQ profile) leveraging technologies readily available to mobile applications and lightweight browser based applications. More info at: http://goo.gl/dSkj7x
	Interconnecting patient data across communities	Ts-IO-5a	High: Patient needs to be identifiable when moving to another community	Use for example - XCPD (Cross-Community Patient Discovery) - Health-Care Encounter Report Document The Cross-Community Patient Discovery (XCPD) profile supports the means to locate communities which hold Patient relevant health data and the translation of Patient identifiers across communities holding the same Patient's data. A community can contain EHRs, PHRs and other systems. More info at: http://goo.gl/Z83DZH The Health-Care Encounter Report Document will hold a set of information to be reported back to the Patients location of origin. It is based on Patient Summary structure, therefore following the same set of constraints and guidelines.

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	Retrieve patient data	Ts-IO-5b	High: Patient data should be retrievable	Use for example - XCA (Cross-Community Access) - epSOS Patient Summary is an electronic document that provides health care professionals with a data set of essential and understandable health information The Cross-Community Access profile supports the means to query and retrieve Patient relevant medical data held by other communities. A community can contain EHRs, PHRs and other systems and healthcare applications. More info at: http://goo.gl/iN41Nq The epSOS Patient Summary is an electronic document that provides health care professionals with a data set of essential and understandable health information in order to be able to deliver safe Patient care during unscheduled and planned care. The Patient Summary's impact is maximal in the settings of unscheduled care. Some of the sections used in this document are: • Active Problems • History of Present+Past Hilliness • List of Surgeries • Allergies and Other Reactions • Allergy and Intolerance • Immunizations • Medical Devices • Procedures and Interventions
	Retrieve identities/profiles	Ts-IO-5c	High: profiles need to be retrievable	Use for example XUA (Cross-Enterprise User Assertion). The Cross-Enterprise User Assertion Profile (XUA) provides a means to communicate claims about the identity of an authenticated principal (user, application, system, etc) in transactions that cross enterprise boundaries. The XUA Profile supports enterprises with different authentication mechanisms. More info at: http://goo.gl/4i81NX

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	Exchange of documents	TS-IO-6	Medium: exchange of documents should be possible	Use for example - XDR (Cross-Enterprise Document Reliable Interchange) - XDM (Cross-Enterprise Document Media Interchange). - XDS (Cross Enterprise Document Sharing) Cross-Enterprise Document Reliable Interchange (XDR) provides document interchange using a reliable messaging system. This permits direct document interchange between EHRs, PHRs, and other healthcare IT systems. More info at: http://goo.gl/T7sL6q XDM Provides document interchange using a common file and directory structure over several standard media. This permits the Patient to use physical media to carry medical documents. More info at: http://goo.gl/4TKIk6 XDS (Cross Enterprise Document Sharing) shares and discovers electronic health record documents between healthcare enterprises, physician offices, clinics, acute care in-patient facilities and personal health records. More info at: http://wiki.ihe.net/index.php/Cross_Enterprise_Document_Sharing
	Compatibility with different browsers to be determined	TS-IO-7	High: platform needs to work with different browsers	
	Device Directive conform solutions	TS-IO-8	High: platform needs to comply with existing directives	Conform with the relevant European Device Directive

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4.4 Business Requirements (Coding: BR)

The Business Requirements are self-explanatory. Hence, no additional comments section was developed for this requirements dimension. Sub-categories and requirements including their coding and relevance are detailed in the table below.

Sub-category	Requirement	Coding	Ranking
Customer Service (Coding: CS)	The SHAPES Platform shall adopt a customer logic (B2C and B2B) in its design and development.	BR-CS-001	High
	The SHAPES Platform shall have its own Terms of Use and Services Policy.	BR-CS-002	High
	The SHAPES Platform shall have its own Privacy Policy, observing applicable regulations, including the GDPR.	BR-CS-003	High
	The SHAPES Platform should implement a customer support service.	BR-CS-004	Medium
Pricing (Coding: P)	The SHAPES Platform shall be cost-affordable based on the system's modularity and configurability.	BR-P-001	High
	The SHAPES Platform shall support various business models (e.g., direct sales, licensing, subscription, PaaS).	BR-P-002	High
	The SHAPES Platform shall support multiple subscription models (e.g., free, standard, premium).	BR-P-003	Medium
Marketplace (Coding: M)	The SHAPES Platform shall have an online marketplace.	BR-M-001	High

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	The SHAPES Platform Marketplace shall support the registration of suppliers (supply) and of clients (demand).	BR-M-002	Medium
	The SHAPES Platform Marketplace shall select its suppliers based on their offer's effectiveness, affordability and added-value to the Platform.	BR-M-003	Medium
	The SHAPES Platform Marketplace shall contribute to the Platform's monetisation (e.g., fee per transation).	BR-M-004	Medium
	Suppliers in the SHAPES Platform Marketplace shall abide and follow the SHAPES Platform's Terms of Reference, privacy policy and ethics.	BR-M-005	High
	The SHAPES Platform Marketplace should encourage transparent competitiveness.	BR-M-006	Medium
	The SHAPES Platform Marketplace should contribute to building economies of scale (e.g., create supply chains).	BR-M-007	Medium
	The SHAPES Platform Marketplace should contribute to remove existing vendor locks.	BR-M-008	Medium
	The SHAPES Platform Marketplace should contribute to the dynamics of local economies (e.g., aggregation of offers based on location and geographical reach).	BR-M-009	Medium
Sustainability (Coding: S)	The SHAPES Platform shall consider the sustainability of the Platform in its design and development (e.g., economic, financial, social and environmental).	BR-S-001	High
	The SHAPES Platform shall observe universal accessibility policies (e.g., consider the public authorities' role with respect to subsidising schemes).	BR-S-002	High

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	The SHAPES Platform should consider the adoption of standards in its design and development, from a business sustainability perspective.	BR-S-003	High
	The SHAPES Platform should foster corporate social responsibility (e.g., contribute to societal goals of a philanthropic, charitable or activist nature, by supporting volunteering or ethically-oriented practices).	BR-S-004	Medium
	The SHAPES Platform should observe a cradle-to-cradle approach.	BR-S-005	Medium
	The SHAPES Platform should provide an open API and uses interoperability standards (e.g. IHE) so as other platforms are able to connect with it in a secure manner.	BR-S-006	High
	The SHAPES platform needs to be taught by proficient tutors for older adults to improve adaptability.	BR-S-007	High

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5 Contextual factors to the platform implementation

An important aspect that needs to be taken into consideration when developing and implementing the SHAPES platform are the contextual factors relating to integrated care in general but also the individual realities of care givers and receivers.

For example, D3.1 "Ecological Organisational Models of Health and Care Systems for Ageing" has described the current 'as is' situation pertaining to health and care systems across Europe. In addition to this, different phases of the pathways into and out of institutional care have been illustrated through a swim lanes graphic (p. 67 of Deliverable 3.1). This graphic also depicted the several functionalities of the platform and related them to respective phases which should be considered during the development phase.

With respect to integrated care, Deliverable 3.2 "Scaling-up Improved Integrated Care" wrote for example:

> *"For the SHAPES consortium integrated care focuses on the needs of the recipient of care, on coordination between diagnosis and treatment and between primary care and secondary care, as well as between different therapeutic areas and specialities. Benefits of integrated care models are clear, such as improved outcomes, established chains of prevention, diagnosis, treatment and care across the system). Still, the complexity of health and care systems in individual countries and regions adds to the challenge. Health literacy, technology and individual involvement in care are key to making health and care more user-friendly and empowering. This means that citizens, including older individuals, should be empowered to majorly engage with their own health (APPG UK, 2014)."* (V1, p. 5).

D3.2 differentiates - in line with Curry & Ham (2010) and WHO (2016) - three key-models of integrated care that need to be considered:

- individual models of integrated care (micro);
- group / disease specific models (meso);
- population-based models (macro).

These different models share commonalities in terms of requirements towards the implementation of technologies. These factors can be seen as a

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"a toolbox to assess alignment or compatibility of technology with desired change in the care environment, but also with building stones for developing strategies for the adoption, scaling up and transfer of the SHAPES platform and its digital solutions."

Hence, the results of Task 3.2 which will be completed in M30 (April 2022) need to be considered when rolling out the platform. Potentially, the D3.2 results themselves could be made available via the platform since the dissemination of information about healthy ageing was mentioned as a functionality (FR-IS-7).

In addition, it is however important to note that the individual living contexts and conditions vary greatly not only among countries but also individuals. The SHAPES vignettes have sketched this aspect[20]. This means that not only that the individual needs and competences with respect to healthy ageing vary but also the preferences of the individuals that may use the platform. It is hence crucial to allow for an adaptation to these contexts and to embed the platform in the sense that it explains its functionalities and their advantages properly and also provides respective training to the users.

[20] See https://shapes2020.eu/shapes-stories/ (09.03.2021).

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6 Conclusion

A lot of project interaction was organised under Task 3.5 to take into consideration the needs of different actor groups from a range of different (country) contexts and to align the requirements development with all SHAPES partners and work conducted in other Tasks and WPs, particularly Task 2.5 “SHAPES Personas and Use Cases”, Task 3.1 “Ecological Organisational Models of Health and Care Systems for Ageing”, Task 3.2 “Scaling-up Improved Integrated Care Service Delivery”, Task 6.1 “SHAPES Pan-European Pilot Campaign Plan, Knowledge Model and Evaluation Methodology”, Task 8.2 “Assessing the Regulatory Frameworks Facilitating Pan-European Smart Healthy Ageing” and Task 8.4 “Privacy and Ethical Risk Assessment for the SHAPES Platform”.

The first two iterations encompassed the drafting of the requirements, the last iteration focused on the requirements validation, a consistency check across the requirements and dimensions and a final cross-check against the user requirements developed for the digital solutions by the pilot sites. In this final iteration, requirements were validated and weighted in collaboration with the different user groups by the use of online workshop formats and surveys. All concerns and risks identified by the reviewers during the technical review in 2020 have been resolved (also compare section 1.2).

All interactions informed the requirements as continuously documented in a living Excel document which has been translated into Section 4 of this Deliverable. The work conducted under SHAPES Task 3.5 resulted in more than 178 requirements in the five dimensions:

- Functional: 95 requirements (including sub-categories)
- Legal and Ethical: 24 requirements
- Security and Technical: 39 requirements
- Business: 23 requirements

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8 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)	Fundamental rights are part of the Ethics Requirements of WP8 that also apply for the SHAPES platform. Specific ethical requirements for the platform have been developed in close collaboration with WP8.
Biomedical Ethics and Ethics of Care (3.2)	N/A
CRPD and supported decision-making (3.3)	N/A
Capabilities approach (3.4)	N/A
Sustainable Development and CSR (4.1)	N/A
Customer logic approach (4.2)	Business requirements including customer aspects are part of the requirements.
Artificial intelligence (4.3)	AI is part of the security and ethical requirements.
Digital transformation (4.4)	N/A
Privacy and data protection (5)	Part of the Security and Ethical Requirements.
Cyber security and resilience (6)	Part of the Security Requirements
Digital inclusion (7.1)	Part of the Technical Requirements: Accessibility
The moral division of labour (7.2)	N/A
Care givers and welfare technology (7.3)	N/A (indirectly)
Movement of caregivers across Europe (7.4)	N/A

Comments: -

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Annex I – Mapping of requirements extracted from Task 3.1 "Ecological Organisational Models of Health and Care Systems for Ageing"

The below input was received from Task 3.1. The qualitative input was colour-coded according to the following coding:

Green = already covered in requirements list

Yellow = possible addition

Red = irrelevant

Input	Relevance for SHAPES Platform	Link with Platforms Requirements
Technological Requirements		
Electronic medical records (EMR) systems should be able to exchange information through the use of recently published international standards for their interoperability and clinically validated information structures (such as archetypes and international health terminologies), to ensure consistent and more complete recording and sharing of data for various patient groups. Such systems are counteracting the obstacles of differing clinical languages and styles of documentation as well as the recognized incompleteness of routine records		See T-IO-5
Health providers need support to use the information and technology system tool and the system itself undergoes continuous alterations to become more user friendly and fulfil the expectations of the providers		See FR-HS-2 and T-AC-1

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Beneficiaries need continuous guidance to navigate correctly through the system. They also need to familiarize and adjust to the concept of personal doctor and what this entails		See FR-HS-2
Need to digitise healthcare processes and move away from paper-based processes		: Too generic – many functional requirements deal with this digitalisation of healthcare processes
Unifying public and private outpatient provision of drugs created transient problems of entry and adequate circulation of drugs to pharmacies		FR-HS-3f and FR-HS-7
Providing facilities to patients to enable them to monitor their health or condition, and to participate in the development of their treatment plans. In part, this needs the integration of telemedicine which enables patients to take measurements, enter their health data into an individualised device, and to share their concerns with their GP		See FR-HS-3 and all subsections
ICT standardization		See technical requirements
Better communication with region – telemedicine should be a part of the strategy for elderly people; Designing of system in cooperation with social care providers		This applies to the identification of requirements, i.e. our current work
Cooperation with professional associations, certification authority, insurance companies		What sort of cooperation? When?

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Need for coordination and integration of the healthcare and social care sectors		We are trying to get their input for the platform development
Need tailored digital solutions to be able to properly communicate with older people		See T-AC-1
Need to digitally upgrade established healthcare services; Solutions and the platform need to be able to upgrade		healthcare services need to do this on their own, but also T-OS-1
Achieve impact at scale		See T-SC-1 and T-SC-2
Telemedicine		
Telemedicine: Telemedicine to enable patients/HCP to monitor their conditions at home to prevent adverse health outcomes and reduce the pressure on healthcare system:		See FR-HS-3 and subsection
Enable patients to communicate with the GP		See FR-IS-1 and FR-IS-2
Reduces need to come to the practice		See above

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However, some problems cannot be resolved via telephone, e.g. control of blood pressure or measuring of glucose levels		See FR-HS-3 and subsections
Integrated national systems where different components "talk" to each other. Following criteria need to be fulfilled:		
GDPR compliance		Covered in Legal and ethical requirements section
Data owned by patient who decides what data they want to share		See LE-ET-4 through LE-ET10
Greater levels of task-sharing between GPs, nurses (i.e. Advanced Nurse Practitioners (ANP)) and midwives: - e.g. prescription of certain medicines and diagnostics - provision of patient care		See FR-IS-5
A permanent helpline, technologies for tele-assistance and respite services should be created and/or developed		See FR-HS-1
Technological devices such as computers, tablets and smart phones are also perceived as too impersonal		Maybe LE-ET-2
Older adults need to be able to familiarise themselves with technological devices but USIDEC students are both reluctant and curious at the same time		See FR-HS-2

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Older adults need to be able to understand the devices to lose their fear, and to understand what they can be used for. tactile approach very important		See FR-HS-2 and LE-ET-2
People are very curious about technology and they like it when they become more familiar with the devices and figure out how they work and what they are for		See above
Increasing need for the adoption of telemedicine and robotics to be able to provide good quality care despite decreasing staffing numbers		FR-IS-5
keep cost down		B-CS-1
avoid having to cut time spent with care recipients		FR-IS-5
True co-design and co-production and allocate resources appropriately based on patient need		The pilots should help with this aspect.
Integrated national system: The encompass programme is a Northern Ireland-wide initiative that will introduce a digital integrated care record to Northern Ireland. This will support the HSCNI vision to transform health and social care in order to improve health outcomes and create better experiences for those receiving, using and delivering services:		See T-IO-3
Policy		
Investment in the digital economy and in improvement of workers' digital skills is essential for bolstering productivity.		Rather policy than platform aspect.
Increase in capacity of the business sector to innovate and boosting access to finance and investments that focus on well-defined areas of smart specialisation are crucial to improve Cyprus's competitiveness and that of its SMEs in particular		Rather policy than platform aspect.

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Maximise investment in and prioritise digital technology.		Rather policy than platform aspect.
Reconfiguration of services create a single accountable care organisation for Northern Ireland that can move money as is required.		Rather policy than platform aspect.
True co-design and co-production and allocate resources appropriately based on patient need.		Covered in pilots.
Long-Term-Care: prioritise healthy and active aging early on to reduce dependency on long-term care and find some way to fund appropriately		See Health Maintenance Support FR-HM-1, FR-HM-2, FR-HM-3
More intergenerational care and improvements in built environment		Rather policy than platform aspect.
Health providers need support to use the information and technology system tool and the system itself undergoes continuous alterations to become more user friendly and fulfil the expectations of the providers		See FR-HS-2 and T-AC-1
Horizontal integration in healthcare in the care of chronically ill.		Rather policy than platform aspect.
Thorough education of patients and staff		FR-HS-2
More staff required to provide adequate care to patients. This does not necessarily mean an increase in GPs, but in community nurses that are trained to take on greater responsibilities, particularly routine tasks		Rather policy than platform aspect.
Cooperation with professional associations, certification authority, insurance companies:		The platform will be available to them
Move away from a hospital-centred care model towards one where care is predominantly provided in the community		Rather policy than platform aspect.

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Human Factors		
Greater levels of task-sharing between GPs, nurses (i.e. Advanced Nurse Practitioners (ANP)) and midwives: - e.g. prescription of certain medicines and diagnostics - provision of patient care		FR-IS-5
Increase of number of ANPs and midwives from 328 (0.6%) to 700 by 2021		Rather policy than platform aspect.
Carers should have a support plan. Professionals from the health sector and from social care should be involved in the definition of such plan, which should include easy access to specialist consultations		FR-IS-11, FR-HM-1, FR-HM-2
Carers should have better access to information and capacity-building, through individual interventions and the establishment of self-help groups		FR-IS-7, FR-IS-8, FR-IS-9
Consideration should be given to using social benefits to reduce the risk of poverty for carers, and/or financial support compensating them for the loss of earnings resulting from taking on caring duties, for example part-time employment		Rather policy than platform aspect.
Giving carers the option of taking emergency leave should be considered		See above
Carers should be given incentives to engage in programmes of professional (re)qualification; and consideration should be given to ways of supporting them to remain in or re-enter the labour market and/or self-employment		See above

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Social partners should be involved in the debate on how to reconcile caring duties and professional life in ways that avoid negative impacts and discrimination, especially in terms of gender		See above
The social value should be recognised of companies that promote good work practices and support for informal carers:		Societal issue.
Data should be gathered regarding the effect of informal caring on the carers and on the persons cared for		FR-HM-1 and subsections; these data could be used for such a study
Benefits of informal care for the health and social systems should be analysed		Data in the project could be used for this study
Policy recommendations		
Ensuring that formalising and improving the status of informal carers does not perpetuate the over-reliance on family members (especially women) for care provision		Data on informal health carers can be taken from FR-HM-1 and subsections
Widening access and affordability to formal LTC in order to ensure that large segments of the population are no longer excluded		Duty of national governments; SHAPES might lower costs
Revising entitlement to benefits, especially cash benefits, ensuring a closer linkage to the level of dependency rather than focusing excessively on means-testing criteria		Rather policy than platform aspect.
Revising the amount of the cash benefits		Rather policy than platform aspect.
Granting tax benefits to those taking responsibility for caring for their relatives:		Rather policy than platform aspect

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Allowing time spent on care to count towards the workers' social security contributions record, e.g. for pensions:		Rather policy than platform aspect
Assessing the constraints on the use of home-based care services that currently prevent them from representing a real alternative to institutional services		Rather policy than platform aspect
Allowing greater flexibility in working schedules (e.g. starting and finishing times, establishment of a bank of hours, concentrated working schedule, incentives for tele-working) in order to facilitate the caring needs of jobholders (bearing in mind possible gender impacts)		Rather policy than platform aspect
Developing a process of systematic monitoring and evaluation of public policies in the field, including ex-ante assessments		Rather policy than platform aspect
People are fearful of using technology due to the perceived risks to their health. Technological devices such as computers, tablets and smart phones are also perceived as too impersonal:		Maybe LE-ET-2
Workforce: Upskilling workforce to redirect work historically completed by one healthcare practitioner to other competent members of staff.		Rather policy than platform aspect.
Use upskilling to optimise unit costs to the maximum level		Rather policy than platform aspect
Ethics		
GDPR compliance:		Covered in Legal and ethical section
Data owned by patient who decides what data they want to share:		Covered in Legal and ethical section

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Annex II – Mapping of ProACT Requirements against SHAPES platform requirements

PeoACT Requirement [n° keyfinding linked]	Explanation	SHAPES Link
R1 ProACT should be designed and implemented to **support and empower human care**, in all its aspects and not to completely substitute it. This might involve providing different types of support on demand.	For a successful implementation of the system in term of acceptance and trust by final users, technology should be clearly considered as a support for a better care and quality of life, and not as a competitor of human care.	Different supportive *functional requirements* have been formulated.
R2 The concept behind the design of the ProACT system and its end user interfaces should be that of the **"supportive friend"** that helps to cope with chronic conditions and the impact of these conditions on wellbeing and quality of life, including the overcoming of barriers.	Many PwM might feel more disabled by their pathology than they actually are. ProACT should help them to be reactive and find and use solutions for changing conditions.	Integrated into functional requirements → FR-HS-3
R3 The architecture of ProACT should be **open, modular and flexible** allowing for the further development of the platform in order to respond to emerging **health and social care needs** at individual and institutional level.	The typical needs that ProACT aims to respond to are part of larger areas of health and social care needs of citizens in different conditions. These conditions are not static but develop over time, as well as the response to	Relates to the following technical requirements: - Scalability - Openness (introduced based on ProACT example)

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	changing care needs that the institutions might wish to provide.	
R4 Any deployment of ProACT should be preceded by a care ecosystem analysis that identifies the functions performed by the different actors and **personalises the functionalities** of the system accordingly.	Care ecosystems are often complex and sometimes fragile with different actors performing different functions. It is important that ProACT adapts to this ecosystem and not that the ecosystem has to adapt to ProACT, unless there is consensus and clear benefits.	Technical requirement: T-FT-1
R5 ProACT should take the role of the **informal carer** in very serious consideration as this "trusted" natural ally of the PwM will have a key role in the correct use of the system on the end user side.	The existence of a collaborative informal carer in the home care ecosystem is considered a key condition for success or, in case of serious health problems, even for intervention.	N/A since SHAPES will serve a multitude of stakeholders.
R6 ProACT should be predisposed to address different challenges related to **independent living and personal safety**.	ProACT should take into account the difficulty of many frail elderly to self-manage different aspects of daily life, including planning of activities, remembering appointments, controlling the environment (temperatures, humidity, presence of smoke, fire, water, etc.)	Respective functional requirements have been developed.

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R7 The ProACT ecosystem should support **activities and participation**.	Many stakeholders have identified social isolation as an important factor for the development or worsening of chronic pathologies. Therefore, ProACT should actively stimulate users to get engaged in on & off line activities of social interaction. This might mean moving away from a predominantly medical connotation of ProACT towards a system that is also able to strongly support wellbeing and social interaction.	Functional requirements for communication have already been developed.
R8 ProACT should take into account various **events** that may disturb the self-management process and the system should be able to cope with them and be robust in case of critical ones.	Self-management is a complex process. Its success depends on many factors. These factors, together with unexpected events might disturb the self-management process.	Different functional requirements including health parameter observation, sensors to report falls, etc. have been developed.
R9 ProACT should be fully **accessible** for persons with disabilities and offer the possibility to personalise user interfaces in terms of complexity, accessibility and the number of functions available.	Users will need different functionalities and maybe not all functions right from the start. They might further have a wide range of conditions that have a negative impact on sight, hearing, movement, strength, cognitive skills, etc.	Integrated into technical requirement: Accessibility (T-AC-1)

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R10 ProACT should include applications that **facilitate the communication** between different actors in the care ecosystem.	Caring for PwM might involve a complex ecosystem of actors each contributing to the overall personalised care plan. Interaction with text and multimedia contents will improve the quality and the speed of information exchange and thus the quality of care.	Respective functional requirements have been developed.
R11 In case of choice between two components having a similar reliability performance, ProACT should incorporate or be prepared to incorporate **most cost effective solution** available on the market.	In some cases patients might need to buy the equipment themselves, or contribute financially. In order to make the financial threshold as low as possible ProACT should be able to offer different options.	Business requirement B-CS-1
R12 ProACT should be fully compliant with **sensitive data** treatment legislation.	Compliance with legislation in this field will be a prerequisite for the adoption of the system in any care context.	Is already integrated into Ethical and Legal requirements
R13 ProACT should provide **facilities to store and retrieve data** and to dialogue with other information management systems, using **interoperable standards**.	Health and social care providers aiming to introduce eCare solutions, in rapidly changing care, technological and demographic scenarios, will preferentially choose systems based on open architectures and protocols.	Interoperability = Technical requirement

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R14 ProACT should use **validated and reliable** sensors and measurement devices.	ProACT will only be acceptable to clinical health professionals if data are reliable and the correct functioning of measurement devices is monitored over time.	Has become a technical requirement: T-RB-3
R15 ProACT should be able to display its services at **different levels of complexity**, allowing people to get gradually used to the system.	PwM that have to start to use ProACT might benefit from configurations with different levels of complexity, thus allowing the user to gradually move towards a more extended use.	Has become a technical requirement: T-SC-2
R16 ProACT should be able to support **therapy compliance**, as this is one of the most critical issues identified in the self-management of care.	For many people taking medicines at the right time of the day and in the right order and dosage is a real problem where ProACT could make the difference.	Medication reminder = functional requirements
R17 The focus of ProACT should be clearly directed to the management of **single and multiple chronic conditions** taking account of the various implications of the conditions on the quality of life of the patient.	The management of chronic conditions and the mitigation of their implications should be a core characteristic of the system.	Respective functional requirements have been developed.
R18 ProACT should include **tutorials and help cards** regarding its use and the use of the devices connected to it. Also a **glossary** of terms could be helpful.	Many users might not be familiar with digital technology, including the interaction with menu's, icons and other aspects of the digital experience.	Has become a functional requirement: F-HS-2

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R19 In its interaction with the users ProACT should be **explicit about the benefits** of its use (prompts, feedbacks, rewarding messages, etc.)	Users might have different personal reasons for not using ProACT unless the advantages are made very clear and are realistic.	Has become a functional requirement: F-HS-10.

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Annex III Mapping of Feedback on Platform Requirements NHSCT

	Action taken by Task 3.5
1. Legal and ethical requirements	
a. LE-GE-26 Data subject rights to be forgotten. In addition to this we would like to see functionality that allows participant withdrawal from a pilot with a variety of options e.g. remove from the study completely or the ability to use data up until the point of withdrawal providing consent is provided.	Additional functional requirement integrated: FR-IS-11 (new); previous FR-IS-11 now FR-IS-12
b. The right for a data subject to request a copy of the information held about them. If participants take part in <1 pilot there will need to be a mechanism to link data/IDs and reduce duplication.	New Requirements: FR-IS-11b
c. LE-GE-38 ensure this is in line with EU medical device regulations	Comment added
d. LE-GE-40 DPIA for each pilot. Should this be for each use case or replicating site?	Should be conducted for each use case and replicating site.- Comment added.
e. Capability to enter manual data e.g. if there is a problem with a blood pressure device data transmission but device has displayed the results to allow these to be entered in manually	Requirement added: FR-HS-3h
f. LE-ME-12 nominate a DPO for each pilot- should this be for each site?	Question added → needs to be clarified.
2. Technical requirements	
a. Compatible with IOS and android smartphones	New requirement added: T-AC-5
b. T10-14 ePrescription – this would not be compatible with the legal process in the UK at present	Comment added

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3. Business requirements	
a. Nothing to add at this point	N/A
4. Security requirements	
a. Password management- mechanism to deal with forgotten passwords/ issuing new passwords	New Requirement added: S-RM-8
b. Permission/access privilege management – should record who has access to what and when. Multi-level permissions overall>pilot level>site level and different stakeholder groups clinicians/service users/caregivers /inspectors/admin/service providers/technical partners etc.	New functional requirement added: FR-IS-10a
5. Functional requirements	
a. **A large number of the functional requirements are indicated as not available to the second/third pilot cycle Feb 22/Feb23. These functionalities are required for Pilot 3 which is due to begin Phase 4 in September 21**. FR-HS-4, F-HS-5, FR-HS7, FR-HS-9, FR-HS-12, FR-IS-2, FR-IS-3, FR-IS-4, FR-IS-5, FR-IS-6	Availability has been changed for most functional requirements to August 2021
b. FR-HS-3a also applies to UC-PT3-001	Added accordingly
c. FR-HS-3G also applies to Pilot 3 use cases	Added accordingly
d. FR-HS-3f will be used to a limited extent in pilot 3 i.e. a list of medicines will be managed and updated as required	Added accordingly

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Annex IV – Mapping of Feedback on Platform Requirements Clínica Humana

	Action taken by Task 3.5
Functional requirements	
• Measuring daily steps (to measure daily activity) FR-HS-3a → Also for PT3-001	Added accordingly
• Sleep tracking FR-HS-3d → May be added to PT3-001	Added accordingly
• Medication tracking FR-HS-3f → Also for PT3-001	Added accordingly
• Monitoring of vital signs (weight, blood pressure, blood glucose, bioimpedance, heart rate, blood oxygen level, etc.) FR-HS-3g → Also for PT3-001	Added accordingly
○ Sometimes, the parameter is measured more than once, if the first one gives and abnormal value. If values are collected automatically, a functionality to detect 'final' value would be nice. This may be specialist-dependent though. An example would be 'blood pressure', if it is high a second measure is recommended after 10-15 min of resting. Maybe it's difficult to implement as a functionality, as 'guidelines' are different at each site and a standard protocol does not exist.	Comment added
• We are defining many more parameters to be monitored in the pilots we lead (PT3-001, PT4-002 and PT6-002). They are described in our data plans, however, they are not finished files and some of the parameters may drop out during the definition process. If you want to include them let me know and I can give you their localization in Teams. But maybe you prefer to include them in the next iteration as if a parameter drops out, you will have gaps in the codes.	Parameters need to be determined: comment added
• Recording the perceived state of well-being / self-assessment tool F-HS-5 → Related questionnaires applied to PT3-001 and PT6-002	Comment added accordingly
• Medical emergency alert system FR-HS-9 → Considered in PT3-001	Noted accordingly

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• Ability to provide questionnaires to monitor health-related quality of life, medicines adherence, symptoms etc FR-IS-5 → We are still defining these type of requirements but I expect that it could be complemented with: ○ On a regular basis (time frequency) ○ Based on other data (for example, if older person is feeling worse than the previous days, to launch a set of questions)	Noted accordingly
• Same comment as Nicola (NHSCT): "**A large number of the functional requirements are indicated as not available to the second/third pilot cycle Feb 22/Feb23. These functionalities are required for Pilot 3 which is due to begin Phase 4 in September 21**. FR-HS-4, F-HS-5, FR-HS7, FR-HS-9, FR-HS-12, FR-IS-2, FR-IS-3, FR-IS-4, FR-IS-5, FR-IS-6"	Has been changed to August 2021
• New ones:	
○ In PT4-002 and PT6-002, care receiver carries out exercises. The exercises can be scheduled beforehand by the care provider (particularly in PT6-002). It would be good if the platform allows the scheduling of specific tasks for each session and person, so the "digital solution" knows what to do at each session and to whom.	The following requirement was added: Scheduling of specific tasks for the care receiver — **FR-IS-5a** This functionality could support the implementation of the pilots.
○ Data source: we are still defining this but it may be useful to include fields of metadata that defines the origin of the value (to be able to track back the origin at any time). The structure depends of the type of data. For example, in PT3-001 we will ask "the year of diagnosis of your heart failure condition". The answer may be confirmed by 1) a medical report; 2) told by care receiver (who can be more or less sure); 3) told by the caregiver (again, who can be more or less sure). Our data plans will include these fields for our data (also finding a balance because filling all the info may imply very long interviews).	The following requirement was added: Include fields of metadata that define the origin of a value — FR-IS-4a

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○ That automatically loaded data (for example from blood pressure meters) can also be inserted manually by older person/caregiver (connection may fail and they may have the necessary digital skill to do it on their own. Tracking who is inserting this should be added (device | older person | caregiver | …)	The following requirement was added: Capability to enter manual data — FR-HS-3h
○ To be able to provide motivation/encouragement sentences, pieces of information/educational information about the condition, …. And in general, short sentences which are provided to the older person and no answer is expected. These set of sentences are to be provided on a regular basis or based on the values of other data. These sentences can be grouped, and the sentences in a group are interchangeable (providing variety to the information provided).	The following requirement was added: Provide motivation/encouragement sentences to the care receiver: These set of sentences are to be provided on a regular basis or based on the values of other data, completion of tasks, etc. — FR-IS-5b
Technical requirements	
• Some data may be stored at SHAPES platform and other must be stored at pilot sites	Comment was added to the following requirement: Data protection principles: lawfulness – identify and document a lawful basis for processing data. — LE-GE-31
• One person me be using different digital solutions. To avoid duplicities.	This should be covered by the Technical Requirements on Interoperability.

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Annex V – Mapping of User Requirements developed by the SHAPES pilots (WP6 link)

The below details an exemplary mapping of the WP6 User Requirements relating to the Digital Solutions. Since D3.9 had to be completed before the entirety of the requirements, we selected advanced drafts to ensure that the development of the Digital Solutions (DS) and the platform are aligned.

Please note that the style of the tables vary based on the input template developed by the pilots and use cases under consideration.

PT-01-001

PT1-UC001 Remote In-Home Wellbeing Monitoring and Assessment

Requirements	Mappin against Platform Requirements
Wellbeing Assessment Score	Already considered: FR-HS-5
Home Monitoring (temperature, humidity, air quality)	New requirements: FR-LS-5
Appliances Monitoring (on/off; duration of state)	New requirement: FR-HS-13
Physical activity monitoring (daily steps, time of exercise, intensity, objectives, reminders)	Already considered: FR-HS-3
Sleep data monitoring (duration, begin/end; day time sleep; wake ups at night, tip on good night routine)	Already considered: FR-HS-3
Monitoring vitals (heart rate)	Already considered: FR-HS-3g

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Patient Data (Age, gender, degree of dependence, individual top three challenges)	Requirement specified under FR-IS-6 → FR-IS-6a
Caregiver data (age, educational degree, distance to reach care receiver, access to internet, technological skills)	Requirement specified under FR-IS-6 → FR-IS-6b
Caregiving data (type of care, duration and frequency of care delivery, number of caregivers, relationship)	Requirement specified under FR-IS-6 → FR-IS-6c
Wellbeing Status (smiley card)	Already considered: FR-HS-5
Data analytics (personalised recommendations, wellbeing assessment, anomaly detection)	Already considered: FR-HS-4, FR-HS-9 and FR-HS-12

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PT-01-004

Robot to Support Older People to Live Independently and Remain Socially Connected		
User Requirement	**Link wiht Platform Requirements**	**Priority (PAL)**
MAIN PERSONA: Older individuals that live on their own independently. They have a caregiver but that only visits a few days a week, and otherwise visited by family members. The individuals are healthy but still need to be somewhat motivated about the variety of social events and possibilities of further entertainment at home in order to keep them active and keep them engaged with the community		
SECONDARY PERSONA: the informal or formal caregiver/concierge		
AIM1: remote temperature monitoring to detect potential COVID-19 users	n.a.: general aims but not translating into a requirement	
AIM2: To remain independent for longer at home		
AIM3: to entertain older individuals and help them engage in different cultural activities		
AIM4: to make older individuals feel safer and more confident to move around the house		
AIM5: to help older individuals socialise with friends/family members		
AIM6: to keep main persona active (physically, cognitively, socially)		
AIM7: to give peace of mind to secondary personas (alerts)		
HOW1: Detect user temperature using robot's in-built thermal camera. The robot approaches user to suggest temperature monitoring. If temperature too high, alert caregivers and inform user.	Temperature monitoring: FR-HS-3g	HIGH

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HOW3/6: Give personalised reminders and follow-ups based on personal needs (e.g. drinking water, playing a game, getting medication, shopping list) and interests (e.g. close-by events such as movies). Robot retrieves reminder 5 minutes prior in order to undock, navigate, detect person, approach, say reminder	Personalised reminders: FR-HS-4 (Action Plans)	HIGH
HOW3/6: Provide with different games: TicTacToe, Chess, etc and physical exercise games; using robot arms using touch-screen, robot speech for encouragement, instructions and gestures.	FR-IS-10: Gamification/availability of games	HIGH
HOW4/7: In case the robot detects a fall or increased temperature, alert caregiver or medical personnel.	Automatic alert: FR-LS-3	MEDIUM
HOW5: Video call option	Video conferencing: FR-IS-1, FR-IS-2	HIGH
HOW3: Image viewing and music playing for entertainment.	FR-IS-6	MEDIUM
HOW4: Guest detection (face recognition). Instruct older person on procedure to receive visitors.	n.a. – robot specific functionality	MEDIUM
PARAMETERS TO MONITOR	n.a.	
Number of interactions with the robot: timestamp, name of activity, total interactions		
Alerts: timestamp, type		

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ADDITIONAL REQUIREMENTS		
Call robot using speech to come closer		LOW (challenging)
User can ask for information: list of medications, reminders of the day ...	FR-IS-6 and FR-IS-7	HIGH
Voice interaction: Spanish and mapping to robot actions	FR-IS-3	HIGH
To be able to launch reminders schedule by time/date and send to robot action	FR-HS-4	HIGH
Dashboard for alerts	FR-IS-6 and FR-IS-7	MEDIUM
History of alert	FR-IS-6 and FR-IS-7	MEDIUM
Specific alerts sent to health professional's smartphone	FR-LS-3	HIGH
Robot touch-screen interface	n.a. – robot specific functionality	HIGH
User recognition	n.a. – robot specific functionality	HIGH
User detection	n.a. – robot specific functionality	HIGH
Search for person behaviour	n.a. – robot specific functionality	HIGH
Fall Detection	FR-LS-3	MEDIUM

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PT-02-001

UC-PT2-001 USER REQUIREMENTS

Remote monitoring of key health parameters

#	User Requirement	Comments
UR-01	MAIN PERSONA: Older individuals living at home by themselves, insufficiently informed about the realm of their capabilities thus subject to suffer from isolation and associated risks such as loss of speech, vitality, and lack of general fitness. The individuals at stake are still rather agile but need to be somewhat motivated and/or informed about the variety of physical and mental activities at their disposal or within their reach in order to keep exercising regularly and/or entertain social contacts. The older individuals are inclined to stay "in touch" with others from the community as well as with virtual assistants to maintaining their mental and physical health.	
UR-02	SECONDARY PERSONA: the informal or formal caregiver/ a predefined person of trust.	
UR-03	AIM1: the remote monitoring important health and wellbeing parameters of older individuals	Platform requirements FR-HS-3
UR-04	AIM2: to maintain or possibly even improve their health and wellbeing status thanks to preventive health and care measures.	Platform requirements FR-HS-4
UR-05	AIM3: to remain independent for longer at home	This is more a goal/need than a requirement --> not considered
UR-06	AIM4: to showcase the so-called "feel-good effect" i.e. the power of knowing everything is – relatively speaking – in order.	This is more a goal/need than a requirement --> not considered
UR-07	AIM5: to make older individuals feel safer and thus more secure in pursuing daily activities such as moving around the house or outdoors, engaging with family, friends and the community or committing to further hobbies.	This is more a goal/need than a requirement --> not considered

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UR-08	HOW1: **Capture unobtrusively the relevant health and wellbeing parameters** of the older individuals at home (the parameters listed below). Using wearables, sensors and other devices. Recording quantifiable health data. Using Ambient Intelligence Health and Wellness Platform / Smart Living at Home Platform.	Platform requirements FR-HS-3
UR-09	HOW2: **Recording the perceived state of well-being** should be included ("How do you feel today"). Recording a stable (good) health status will make older individuals feel safer and thus more secure in pursuing daily activities ("feel-good effect"). Using Ambient Intelligence Health and Wellness Platform	New Functional requirement integrated: FR-HS-5
UR-10	HOW3: **Report the health and well-being status** in a tangible/understandable way to the main persona. Using dashboard, chatbot, safe digital assistant. Communicating in natural language.	Links mainly with FR-IS-1 and FR-IS-4
UR-11	HOW4: **Give personalized tips and recommendations** based on health and well-being needs. Using a "personal coach"-concept, the older individuals receive tips to maintain their well-being and health status (e.g. reminders to drink water, walk a few steps, stand-up and sit-down, etc. …). Using Wellbeing and Lifestyle recommendations (physical activity and nutrition recommendations).	FR-HS-4
UR-12	HOW5: In case the system monitors unusual data, the informal caregiver/ a predefined person of trust is informed/alerted. Using smart data analytics & predictive algorithms): **analysis of anomalies and alert generation** based on the data gathered from the different sensors.	FR-HS-4
	Parameter to be monitored	
	1. Daily Steps	New FR integrated: FR-HS-3a
UR-13	MEASURE1: Daily steps (to measure daily activity). Steps should be counted using a pedometer, preferably one being worn on the wrist (it can be worn permanently).	
UR-14	GOAL1: Daily steps target. It has to be set individually. A study has observed women over 62 years and correlated the number of daily steps with the mortality rate. It was found that up to a limit of 7,500 steps/day the mortality rate was reduced. Anything beyond this figure did not mean significant improvement in terms of reduced mortality. However, it is necessary to check individually whether this figure is a realistic daily goal and to adjust it if necessary. As this use case focuses on people in need of care, steps in the range of 1,000-4,000 steps should be aimed	

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	for - depending on the individual physical condition. Above all, people who feel comfortable with a higher daily target should always try and match it.	
UR-15	RECOMENDATIONS1: If at lunchtime 50% of the individual's number-of-steps target has not yet been reached, a reminder can be sent via the smartphone/tablet or a smart speaker.	
	2. Exercise	New FR integrated: FR-HS-3b
UR-16	MEASURE2: Exercise	
UR-17	GOAL2/RECOMENDATIONS2: • Older adults should preferably perform at least 150 minutes/week aerobic physical activity of moderate intensity (e.g. 5x30 minutes/week) or • perform at least 75 minutes/week aerobic physical activity of higher intensity, or • perform aerobic physical activity in appropriate combinations of both intensities (doing at least 10-minute intervals, e.g. at least 3 x 10 minutes/day or 5 x 30 minutes/week) • Older adults with mobility impairments should perform balance exercises to prevent falls at least three days a week • Older adults should carry out muscle-strengthening physical activities at least two days a week • older adults should avoid long, uninterrupted periods of sitting and, if possible, regularly interrupt sitting with physical activity • Older adults can attain further positive health benefits by increasing the amount and/or intensity of exercise beyond the minimum recommendations. • Older adults who cannot be physically active according to recommendations related to medical restrictions should exercise as much as their current health situation allows.	
	3. Water uptake	New FR integrated: FR-HS-3c
UR-18	MEASURE3: Water uptake. Smart drinking bottle. The bottle measures how much has been drunk and reports this to an app. Supplemented by manual entries (e.g. if the older person buys something to drink outside the home or prepares a cup of tea) the daily fluid intake can be documented.	
UR-19	GOAL3: The German Society for Nutrition gives a reference value of 1.5L/day, which is increased to 2L/day in summer	

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UR-20	RECOMMENDATIONS: Reminders are given if the person does not drink enough according to the following guidelines: • a glass of water immediately after waking up (stimulates digestion and circulation) • 3 hours into the day: drink at least 0.5L • 6 hours into the day: min. 0.75L • 9 hours into the day: min. 1 L • 12 hours into the day: min. 1.3 L • 15 hours into the day: min. 1.5L • Cap drinking 2 hours before bedtime in order not to interrupt the night's sleep	
	4. Sleep	New FR integrated: FR-HS-3d
UR-21	MEASURE4: Sleep tracker (e.g. a fitness tracker on the wrist or a mobile phone app), sleep can be recorded. .g. sleep-app "Sleep Better" (Runtastic) or similar. Record sleep quality (how often awake/REM phases etc) and give tips on how to improve sleep the following day/evening	
UR-22	GOAL4: The duration of sleep should be between 7 and 8 hours for older people. However, there are also people who are completely satisfied with 5 hours of sleep and others who need 9 hours of sleep to recover. By surveying the test persons in the first two weeks of the use case duration, it can be determined at how many hours of sleep their individual optimum lies, at which they feel maximally recovered and satisfied.	
UR-23	RECOMENDATIONS4: On this basis, the app can give tips and recommendations as to when the person should ideally go to bed and when they should get up. It could also introduce a good-night routine for people who do not sleep well, such as avoiding artificial “blue light” right before going to bed or recommending drinking a small cup of soothing herbal tea. Tips: → Reminder "good night routine, e.g. • Turn off TV at a fixed time (at least 30 minutes before bedtime) • Drink a small cup of herbal tea • Write a diary entry to remove recurring thoughts for the night • Opening bedroom windows for a few minutes	

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UR-24	TEST1: How to determine individual sleep duration needs Sleep duration test 1 - Determine when you wake up: In Test 1, it is important to get up at the same time every day. What time that is isn't relevant, but you should not be woken up before that time or wake up too early by yourself. You get up as soon as the alarm clock rings at the same time every day or (ideally) you wake up by yourself, you go to bed as soon as you get tired. If you feel too awake, you should not go to bed, just as you should not force yourself to stay awake if tired. If this is maintained over a period of about two weeks, the body is used to getting up at the same time every day. At a certain time the body sends the signal to go to bed by the onset of fatigue. For example, if you get up at six o'clock every day and get tired at eleven o'clock in the evening, your individual sleep duration is about seven hours.	
UR-24	TEST2: Determine your daily sleep time Sleep duration test 2 - Determine your daily sleep time In the second test, it is the bedtime that must be determined. This point in time should be chosen so that it is possible to sleep for nine or ten hours. At best, one is already tired at this time so that one does not lie awake in bed for a long time. No alarm clocks should be set during the test phase. If there is a risk of oversleeping despite the sufficient time span of nine to ten hours, an emergency alarm clock can be set. However, since waking up by an alarm clock can falsify the test, in this case you should rather perform the first test. If the bedtime is observed, you will always wake up at the same time after some time. If you go to bed at ten o'clock in the evening and wake up at six o'clock in the morning, the ideal sleeping time is about eight hours.	
	5. Nutrition	New FR integrated: FR-HS-3e

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UR-25	MEASURE5: Nutrition. Tracking the meals is very complex and requires a lot of discipline, which makes the implementation massively more difficult. Since the test persons are in home care, one could assume that many at least get their lunch from external delivery services such as "meals on wheels". Together with these providers, a system could be designed in which the older persons could simply scan a barcode with their cell phone and the nutritional information from the delivery services would be taken over immediately. The system needs to allow the individuals to indicate whether everything was eaten or only partially / saved for later / shared with others. For many, breakfast and dinner are part of a fixed routine, which means that ready-made standard meals to choose from a “menu” can be provided, making tracking much easier (such as: porridge / white bread with jelly / yoghurt / etc..).	
UR-26	GOAL5: Intake of all needed nutrients	
UR-27	RECOMENDATION5: Such documentation can be used to check whether all nutrients are supplied in sufficient quantities (e.g. based on recommendations by DGE) and whether there is a connection between certain foods and an increased or decreased well-being. Tips can then be given as to whether certain foods should rather be avoided or others should be consumed to a greater extent.	
UR-28	Problem: One problem frequently associated to tracking is that banning certain foods (e.g. the routinely consumed piece of cake in the afternoon or similar) can lead to frustration, which would not increase but rather worsen the well-being. An idea to solve this would not be to give the test persons a detailed overview of the nutritional values eaten, but rather a summary of the day in the form of a traffic light system with the recommendation to eat more fruit and vegetables the next day.	
UR-29	Optional: Working together with the informal caregiver to document food intake.	

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PT-02-002

UC-PT02-002 USER REQUIREMENTS

#	User Requeriment	Link with Platform requirements
UR-01	MAIN PERSONA: Older individuals who live alone and/or feel lonely. They have a desire for more integration in community. This access for interaction opportunities is difficult for the users. This can be due to a lack of information or language barriers, among other things. Individuals have a wide range of interests and desires.	
UR-02	Personnel administrator: could be an external person or an informal caregiver. His or her task could be to support the user in using the platform, to make events available for the platform and to be available for problems or questions.	
UR-03	AIM1: Inform users about activities in the community in the surrounding area.	Inserted new requirement: FR-IS-7e
UR-04	AIM2: Improving the feeling of loneliness and thus enhancing the well-being of the older individuals.	FR-IS-1, FR-IS-7d, FR-IS-8, FR-IS-9
UR-05	AIM3: Relief for the informal caregiver (mostly relatives) through better integration of the individuals in society and the knowledge that the older people do not feel lonely any more	FR-IS-1, FR-IS-7d, FR-IS-8, FR-IS-9
UR-06	AIM4: Relieve physical and mental suffering caused by enduring loneliness.	FR-IS-1, FR-IS-7d, FR-IS-8, FR-IS-9
UR-07	AIM5: The feeling of participation in the community through current and region-related information transfer. Information about the weather, local news, etc. should be available.	FR-IS-1, FR-IS-7a-d, FR-IS-8, FR-IS-9
UR-08 UR-09	HOW1: Proposals of activities and events adapted to the interests and possibilities of the individuals. Offers that are matched to individual needs are possible due to a machine learning component. HOW2: The platform allows easy access to the activities	New requirement: FR-IS-18
UR-10	HOW3: Chat option through which individuals can exchange information online (ROSA, Chatbot)	FR-IS-3

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	Aspects to be monitored/measured	
	1. Users experience - Well-being	
UR-11	MEASURE1: Does the user feel better integrated through the use of the platform? To what level do people feel better integrated? Is the information provided sufficient for the user? Are there any suggestions for improving the integration of ageing people in the community? Does the cooperation with the personnel administrator work well or are there alternatives? How can the project be established sustainably and expanded to various regions?	Evaluation criteria – not relevant for platform requirements
UR-12	GOAL1: At best, the use of the platform would enable ageing individuals to feel more integrated in society. They should feel less lonely.	This is the result – not relevant for platform requirements

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PT-02-003

UC-PT2-003 USER REQUIREMENTS

LLM Care Health and Social Care Ecosystem for Cognitive and Physical training

#	User Requirement	Link with Platform requirements
UR-01	MAIN PERSONA: **Older people 65+** with or without Neurodegenerative disease (e.g. dementia, Alzheimer's and Parkinson's disease), Mild Cognitive Impairment, chronic and mental disorders (Schizophrenia), disabilities (older people who have communication issues due to movement impairments or difficulties in speech (e.g. tracheostomy combined with mobility limitations, or with kinetic disabilities with not enough exercise during ergotherapy). **Caregivers** (formal or informal) who facilitate the training session.	
UR-02	AIM 1: Improve and maintain cognitive and physical health.	
UR-03	AIM 2: Prevent frailty and cognitive decline.	
UR-04	AIM 3: Promote independent living and healthy ageing.	
UR-05	AIM 4: Improve skills/competences/attitudes of older persons and their quality of everyday living.	
UR-06	AIM 5: Provide excellent quality of social and health care service	
UR-07	HOW 1: Offers an integrated solution for cognitive and physical health, providing effective protection against cognitive decline and, thereby, actively improving the quality of life.	Mental exercises: FR-HM-1 Physical exercises: FR-HM-2
UR-08	HOW 2: Non-pharmaceutical intervention against cognitive deterioration	Mental exercises: FR-HM-1 Physical exercises: FR-HM-2
UR-09	HOW 3: The online Cognitive Training system includes six categories with more than 29 effective exercises and hundreds of graded difficulty levels that focus on attention, memory, brain speed, people skills, navigation and intelligence.	Mental exercises: FR-HM-1 and sub-requirements
UR-10	HOW 4: The exergaming platform helps older people physically train and maintain their fitness and well-being, including aerobic capacity, flexibility, balance and strengthening of muscles.	FR-HM-2

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UR-11	HOW 5: Provides a comprehensive solution that has a direct impact on improving the quality of life of individuals.	
UR-12	HOW 6: Receive training and exercise for rehabilitation at home, in order to better communicate, listen to music, watch movies, and train for quicker rehabilitation.	Mental exercises: FR-HM-1 Physical exercises: FR-HM-2
UR-13	HOW 7: Interaction with online app, exploiting Artificial Intelligence (AI), which facilitates the summary of news from a wide range of online resources by excluding all repeatedly presented information and demonstrating it in a unified text.	

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PT-03-General

PT3 - Medical Control and Optimisation					
UC-PT3-general - Supporting multi-morbid older patients					
			NHSCT		
#	**Modules / Components**	**Partner**	**UR Code**	**UC-PT3-general Supporting multi-morbid older patients**	**Link with Platform Requirements**
1	Front-end app for target users				
1.1	eHealthPass App	GNO			
1.1.1	Self-assessment tool with personalised questionnaires (uses a text-based chatbot)		UR-16 UR-25 UR-28	HOW4: Main persona logs signs/symptoms. Using Health and Wellbeing Apps.	Requirement F-HS-5
1.1.2	Notifications		UR-09	AIM8: Deliver reminders, alerts and recommendations to older individuals, concerning the management and control of their medication	Requirement FR-HS-7
1.1.3	Treatment plan				
1.1.4	Control medication		UR-15 UR-27	HOW3: Tracking and registration of intake of medication. Using Health and Wellbeing Apps.	Requirement FR-HS-3f
1.1.5	Register vital signs monitoring		UR-13 UR-22	HOW1: Tracking and registration of vital signs and physical measurements. Use sensors and other devices. Record quantifiable health data. Using Health and Wellbeing Apps	Requirement FR-HS-3g

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1.1.4	Manage diet and nutrition		UR-14	HOW2: Tracking and registration of diet and nutrition data. Using Health and Wellbeing Apps.	Requirement FR-HS-3e
3	Health and Wellbeing Data Gathering / Remote Monitoring / Remote Consults via eHealth Apps & IoT Platforms				
3.1	eHealthPass - integrated care platform	GNO			
3.1.1	Self-assessment tool with personalised questionnaires (uses a text-based chatbot)		UR-16	HOW4: Main persona logs signs/symptoms. Using Health and Wellbeing Apps.	Requirement F-HS-5 & FR-IS-3
3.1.2	Medication control		UR-15	HOW3: Tracking and registration of intake of medication. Using Health and Wellbeing Apps.	Requirement FR-HS-3f
3.1.3	Register health parameters. Synchronise with third-party medical devices (BPM, scale, …)		UR-13	HOW1: Tracking and registration of vital signs and physical measurements. Use sensors and other devices. Record quantifiable health data. Using Health and Wellbeing Apps	Requirement FR-HS-3
3.1.6	Manage diet and nutrition		UR-14	HOW2: Tracking and registration of diet and nutrition data. Using Health and Wellbeing Apps.	Requirement FR-HS-3e
3.1.9	Connectivity to Electronic Health Records using eHealth standards (such as HL7, … and even cross-border)				
3.1.10	Connection with IoT devices (to be defined)				

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3.1.11	Synchronise with third-party Apps - Apple Health, …				
3.2	CCS - TeleHealth System	CCS	UR-19	HOW5: Remote monitoring of patients by doctors and montioring by other care givers. Using Health and Wellness Platform HOW7: Conduct remote consults. Using Telehealth and Telemedicine systems and eCtouch.	Requirement FR-HS-3
3.3	FNOL - Telemedicine System	FNOL			Requirement FR-HS-3
3.4	eCtouch System	OMN			Requirement FR-HS-3
4	MCO Data Model (in SHAPES TP)				
4.1	UC-PT3-general Supporting multi-morbid older patients	UC-PT3-general partners			issue is too general
5	Prediction of Health Events - AI modules (in SHAPES TP)				
5.1	Remote Heart Failure Patients Decompensation Predictive Model	VICOM	UR-21	HOW9: Predict risk of health events including decompensations in patients with heart failure, exacerabations of COPD, and hypo/hyperglycaemia in patients with diabetes. Using smart data analytics and predictive algorithms and Ambient Intelligence Health and Wellness Platform.	Requirement FR-HS-12
5.2	eHST Library - Machine Learning	VICOM			Requirement FR-HS-12
5.3	Exacerbations in COPD Prediction Model	TREE			Requirement FR-HS-12
5.4	Hypo/ hyperglycaemic events in T2D patients prediction model	TREE			Requirement FR-HS-12

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6	Dashboard for patients, caregivers and professionals				
6.1	eHealthPass (main interface to caregivers & professionals)	GNO	UR-02 UR-09 UR-17	HOW5: Remote monitoring of patients by doctors and montioring by other care givers. Using Health and Wellness Platform	Requirement T-AC-1 about accessibility of platform and solutions
6.2	Visual Analytics in Streaming and Batch.	TREE			Requirement FR-HS-3f on medication tracking
6.3	eHST Library - Visual Analytics (integrated in eHealthPass)	VICOM			Requirement FR-HS-3 about collecting and sharing health data

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PT4-002 (DRAFT)

User Requirement	Link with Shapes Platform
MAIN PERSONA: People with early stage dementia, independent or highly independent. They are frequently visited by caregivers, care partners or family members, who can assist with robot interaction and provide guidance during game directions.	
SECONDAY PERSONA: the informal or formal caregiver	
AIM1:	
HOW3: Give personalised reminders and follow-ups based on personal needs (e.g. drinking water, playing a game, getting medication, shopping list) and interests (e.g. close-by events such as movies). Robot retrieves reminder 5 minutes prior in order to undock, navigate, detect person, approach, say reminder	FR-HS-4; FR-HS-7; FR-IS-10 and FR-IS-10a
HOW3: Provide with different games: TicTacToe, Chess, etc and physical exercise games using robot arms using touch-screen, robot speech for encouragement, instructions and gestures. Note: triggered through front dashboard, back tablet (SHAPES App button), no need to send data to SHAPES	FR-IS-10, FR-IS-10a
HOW4: In case the robot detects a fall or increased temperature, alert a caregiver or medical personnel.	
HOW5: Video call option	FR-IS-2
HOW3: Image viewing and music playing for entertainment.	FR-IS-10
HOW4: Guest detection (face recognition). Instruct older person on procedure to receive visitors.	

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PARAMETERS TO MONITOR	
Number of interactions with the robot: timestamp, name of activity, total interactions	
ADDITIONAL REQUIREMENTS	
Call robot using speech to come closer	
User can ask for information: list of medications, reminders of the day ...	FR-HS-7
Voice interaction: Spanish and mapping to robot actions	
To be able to launch reminders schedule by time/date and send to robot action	FR-HS-7; FR-IS-10a
Dashboard for alerts	FR-IS-6, FR-IS-7, FR-HS-9
History of alert	FR-IS-6, FR-IS-7, FR-HS-9; FR-LS-3
Specific alerts sent to health professional's smartphone	FR-LS-3
Robot touch-screen interface	
User recognition	TS-DP-1
User detection	
Search for person behaviour	
Fall Detection	FR-LS-3

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PT-05-001

UC-PT5-001 USER REQUIREMENTS

Online training and support to cope with caregiving to a person with dementia

General comment for the integration into D3.9: Only the aims and "hows" are reviewed for the platform requirements; parameters are automatically monitored.

#	User Requirement	Comments
UR-01	MAIN PERSONA: Family carers of persons with dementia who live in the community (not in institutional care) who struggle with several stressors associated with care provision including time constraints, lack of time to rest; financial pressures, and may experience symptoms of caregiver burden and/or anxiety, and/or depression. The individuals at stake are in need of accessible education and skills training interventions that may help them to stay informed about dementia, offer strategies to provide good quality care and to manage/deal with negative outcomes from caregiving. These carers may face constraints in accessing conventional/face-to-face psychosocial interventions due to full-time caregiving responsibilities, full-time jobs, difficulties in arranging transportation and experiencing discrimination by association (with the person with dementia). The carer must be digitally literate and most likelly inclined to use internet resources to find information on dementia and caregiving issues.	General comment: please also refer to the document UC-PT5-001 Scenario_checked for the FICS framework/analysis informing also on non-functional requirements (usability, style and aesthetics).
UR-02	SECONDARY PERSONA: the person living with dementia (in the community) who may benefit from potential improvements in his/her carer physical and psychological health as well as from new care strategies learned by their relative/carer.	
UR-03	AIM1: to learn about dementia (stages, disease progression).	FR-IS-7
UR-04	AIM2: to learn and apply new strategies in providing practical care (e.g. feed, personal care, transferences) and/or validate employed strategies.	FR-IS-12
UR-05	AIM3: to copy with the negative psychological effects of providing care (e.g. feeling anxious, frustrated, guilty, alone, socially disconnected or supported).	FR-IS-7, FR-IS-8

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UR-06	AIM4: to manage the psychological and behavioural changes in the person with dementia (e.g. aggression, depression, anxiety, sleep difficulties, repetitive behaviour, wandering, etc).	
UR-07	AIM5: to be able to access information and support in a convenient, preferably remote and around the clock service compatible with job and/or caregiving responsibilities. The information and support must be personalized and adjusted to carers needs.	FR-HS-1
UR-08	HOW1: offer a program with reliable, comprehensive and clear information on dementia to the main persona, in a web portal which can be accessed any time/anywhere using a desktop/laptop/smartphone or tablet.	FR-IS-7; FR-IS-12a
UR-09	HOW2: present a program with feasible/uncomplicated strategies ('How-to') to facilitate the practical care of the person with dementia, covering multiple activities of daily living (e.g. eating and drinking; dressing/undressing; bathing/personal care; toilet care, etc).	FR-IS-12b
UR-10	HOW3: present a program with feasible/uncomplicated strategies ('How-to') to manage the psychological and behavioural changes in the person with dementia (e.g. aggression, depression, anxiety, sleep difficulties, repetitive behaviour, wandering, etc).	FR-IS-12c
UR-11	HOW4: showcase easy to implement strategies for the main persona to copy with the negative psychological effects of providing care, through problem solving and cognitive behavioural therapy techniques including relaxation, cognitive reframing, ABC analysis, behaviour monitoring and behavioural activation among others. Relaxation exercises must be supported by audio guidance for an improved user experience.	FR-IS-12, FR-HM-1, FR-HM-2
UR-13	HOW5: offer a program with skills training exercises to appraise and validate the main persona achievements/acquired knowledge and strategies. Offer immediate feedback on answers giver to exercises to increase the main persona engagement with exercises, reduce errors and minimize 'test anxiety'. Offer feedback in an easy to understand manner (colour scheme: red for wrong; green for correct) plus comprehensive feedback (justification/explanation on why an answer might be more or less appropriate).	FR-IS-12-d
UR-14	HOW6: offer a program with personalization features in the web platform including treating the person and the person in care for her name/relationship to mimic the targeted approach in face-to-face interventions (where the main persona is known, treated by his/her name) and to increase the main persona sense of engagement.	FR-IS-12,

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UR-15	HOW7: to allow the main persona to choose the intervention plan (lessons to be performed) according to his/her needs, in order to increase the sense of personalization and motivation towards the programme and to decrease dropout due to the perception of being trained on unsuitable topics to the users' particular case. Allow the modification, at any time, of the intervention plan set by the main persona.	FR-IS-12,
UR-16	HOW8: to offer guidance on the most important issues on dementia and dementia care by suggesting core lessons in the program by default to all new users, which can be performed or not by the main persona according to his/her final choice.	FR-IS-12f
UR-17	HOW9: Offer the main persona with a simple way of keeping track of the lessons they have completed; a star icon marks lessons added to my plan and a check icon marks lessons already concluded; In every new access, lessons start in the page where the users' left in his/her previous access.	FR-IS-12g
UR-18	HOW10: Offer a module to self-record and monitor over time the perceived mood status of the main persona; a mood graph/mood history is displayed to represent mood progress over time in an easy to read/understand manner; real time feedback on mood ratings and mood progression over time may be desired (e.g. "you have been feeling more positive lately'; 'you are not feeling well today, please visit lesson X, y) to increase the responsiveness of the programme to the users' mood status.	FR-HM-1
UR-19	HOW11: Allow the main persona to print personalized booklets of the sessions mirroring the user learning process, i.e. including both lessons contents and the user answers to exercises; in order to cover diverse preferences for accessing the training materials (online/in paper).	FR-IS-12h
	Parameter to be monitored	
	1. Number of logins	
UR-20	MEASURE1: Number of logins per week on the iSupport web platform over a three-month period (from baseline to post-test). The assessment of this parameter serves only an evaluation purpose and does not produce any action or recommendation regarding the user interaction with the system.	All parameters are collected by the system automatically. Other parameters are included in the evaluation protocol.
	2. Date of logins	

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UR-21	MEASURE2: when users access the program over a three-month period (from baseline to post-test). The assessment of this parameter serves only an evaluation purpose - deriving usage data including, for instance, for how long the users keep accessing the program - and does not produce any action or recommendation regarding the user interaction with the system.	
	3. Lessons visited	
UR-22	MEASURE3: which lessons of the program are visited by users. The assessment of this parameter serves only an evaluation purpose and does not produce any action or recommendation regarding the user interaction with the system. It may help determining which themes are more useful for carers.	
	4. Mood ratings	
UR-23	MEASURE4: Mood self-assessments (rates from 1 to 10 - worse to better) over time.	
UR-24	GOAL4: Self-monitor mood status, a method used in behavioural management in which the person keeps a record of his/her behaviour, especially in connection with efforts to change or control him/herself.	
UR-25	RECOMENDATIONS4 (to be confirmed): The program can provide feedback and recommendations on lessons and/or actions for the carer to perform when mood is rated with a 4 or lower or when mood has been consistently rated worse (the average ratings have lowered substantially, e.g. form one week to another). Tips could include: • Call the helpline of the National Alzheimer's Association; • Visit a lesson within iSupport on changing unhelpful thoughts; • Perform a relaxation exercise within iSupport; • Visit a lesson within iSupport on performing pleasant activities; • Ask for psychological support, etc.	
	5. Lesson ratings	
UR-26	MEASURE5: Ratings attributed by users to each lesson. The assessment of this parameter serves only an evaluation purpose - of the clarity and usefulness of each lesson - and does not produce any action or recommendation regarding the user interaction with the system. It may help determining which themes are more useful for carers.	

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PT-05-004

UC-PT5-004 USER REQUIREMENTS

Virtual Patient Scenarios (VPS) – Mobile Virtual Patients (MVP)

#	User Requirement	Link with Platform Requirements
UR-01	MAIN PERSONA: Formal healthcare caregivers develop decision making, reasoning and training skills in their workplace competency and provide sufficient day care and support to older people with Neurodegenerative diseases, including Alzheimer's, Parkinson's disease and mild cognitive impairment	
UR-02	AIM 1: Support user-centred and active learning of formal caregivers.	
UR-03	AIM 2: Develop decision making, reasoning and self-assessment skills of formal caregivers, through the interaction with real-life health-related scenarios.	
UR-04	AIM 3: Familiarize formal caregivers with a range of Neurodegenerative diseases (including Alzheimer's, Parkinson's, dementia, stroke) and other chronic diseases (diabetes, heart disease, etc.), aiming at enhancing their learning skills with regard to symptoms, diagnosis and treatment.	
UR-05	AIM 4: Train formal caregivers in applied knowledge and professional attitude.	
UR-06	AIM 5: Gain experience in day care and support of older people through exposure to a large number of cases and a variety of diseases.	
UR-07	AIM 6: Avoid most common health-related errors during healthcare provision on a safe environment, before exposure to real patients.	
UR-08	HOW 1: Offer problem-based learning activities that simulate real-life scenarios where learners emulate the roles of health care providers.	FR-IS-12: Provision of training material to care providers
UR-09	HOW 2: Provide learning tools that are widely used across various academic institutions, because they consist of an open source toolset that allows the creation and delivery of a	FR-IS-12: Provision of training material to care providers

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	wide range of pathway-based educational activities with an easy-to-use, code-free interface.	
UR-10	HOW 3: Access effective learning tools, which facilitate the transfer of real-life challenges in engaging scenarios which mimic the tensions, distractions and uneven issues that make real-life decisions more difficult.	FR-IS-12: Provision of training material to care providers

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PT-06-002

Gait rehabilitation

Group	Requirements	Link with Platform Requirements
General	Older person must feel comfortable to reduce fear to gait rehabilitation.	Digital solution specific
	Facilitate domestic tasks	Digital solution specific
	Easy to use	TS-AC2
	Health professional to be able to schedule sessions and their definition; to assign the sessions to older people: start/end time, ordered list of exercises, selection of predefined exercises or direct definition (exercise code, circuit, robot-mode, time of pauses -time after continuous walking)	FR-IS-4; FR-IS-5
	Health professional can define types of exercise (exercise code, circuit, robot-mode, time of pauses -time after continuous walking) and assign then to a code/name	FR-IS-4; FR-IS-5; FR-IS-10
	To define exercise at the moment of execution	Digital solution specific
Robot	Robot mode: assisted mode while the robot gives directions; free mode while the robot gives directions	Digital solution specific
	Robot mode: assisted mode without directions; free mode without directions	Digital solution specific
	Handgrips for both hands	Digital solution specific
	That the older person can control the speed while doing the exercise (the robot only runs when the older person walks)	Digital solution specific
	Object recognition to avoid collision	Digital solution specific
	Connectivity to Heart Rhythm monitoring (robot should stop in case of alert)	Digital solution specific
	Robot must have a tablet to show graphical interface	Digital solution specific
	Robot must have a mode when health professional needs to move it to another place and reorient it.	Digital solution specific

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	The robot should check that the initiation of the exercise is always going ahead (if the exercise involves a circuit). SIGNAL if not.	Digital solution specific
Older person-robot social interaction	Voice interaction: Spanish, Greek	Digital solution specific
	Robot looks at the older person when there is no exercise undergoing	Digital solution specific
	Robot should detect if older person is away (toilet, sitting down, ...) in the middle of the exercise. A sign showing the status, for example, saying "waiting for older person". To provide sign when detecting back the older person: "Welcome back!"	Digital solution specific
	Efficient and smooth communication (users may include older people who have communication issues due to movement impairments or difficulties in speech (e.g. tracheostomy combined with mobility limitations, or with kinetic disabilities with not enough exercise during ergotherapy	FR-IS-1; TS-AC-1
	The older person has to know at anytime if they have to go straight or to turn	Digital solution specific
	That the robot makes an introductory speech when older person starts session (after user recognition) and before every exercise: * Introductory sentences (initiation) * Congratulate. Inform about change of exercise (between exercises) * Brief explanation of directions (based on next exercise)	Digital solution specific; link with FR-IS-3
	To launch questionnaires (closed questions/multiple choice) at initiation and end of sessions	Digital solution specific; link with FR-IS-3
	To ask for confirmation before every exercise ("Are you ready?"), signal if "NO"	Digital solution specific; link with FR-IS-3
	To provide guidance/directions while walking (based on localization within the circuit): * assited mode with directions: ** Directions: Go straight / turn left/right * free mode with directions: * Directions and corrections (going off the circuit / wrong turn, back to the trail!)	Digital solution specific; link with FR-IS-3

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	To show a direction arrow on screen when robot give 'turn' direction. Blinking when the older person is turning the wrong way (free mode).	Digital solution specific
	To encourage/motivate while walking. Not interfering with directions.	
	To encourage/motivate while pausing. Not interfering with directions.	Link with FR-IS-10
	To encourage/motivate at the end of the exercise and session	Link with FR-IS-10
	To understand commands from the older person while walking: “stop". Others?	Digital solution specific
	To understand commands from the older person: “where do I have to turn to?".	Digital solution specific
	To understand statement which are alerts to stop: “I don’t feel well”, ”I can’t breathe”	Digital solution specific
	To stablish short-talk conversations: “user: am I doing well?”, “user: this is fun!”	Link with FR-IS-10
	To make a questionnaires with multiple-choice answers (for example, general health at initiation) at the beginning (after introduction) and end of session	FR-IS-3
	To encourage/motivate/support while walking based on detected emotions	Link with FR-IS-10
	To encourage/motivate/support while pausing based on detected emotions	Link with FR-IS-10
	Robot should detect end of session, inform about it and ask to stop. If the older person does not stop it should say this again.	Digital solution specific
	Robot should recognize older person voice (as there may be other people in the room talking)	Digital solution specific
	Integration of chatbot with sensors/collected data outcome (for example, we need to know if the older person is walking or not to trigger sentences)	Digital solution specific
	Tablet showing dialogues when not in exercise, otherwise black or direction signs	Digital solution specific
Security	Facial recognition of older person to provide assigned exercises and/or assigned collected data. Continuous recognition (older person may leave the robot for a moment, only the same older person can continue unless the health professional manually finishes the session)	Digital solution specific
	That face recognition functions equally well with all ethnicities	Digital solution specific
	Face recognition mechanisms should not add actions to the patient (fully operable within the conditions of the scenario, unobtrusive collection of data).	Digital solution specific

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	Ensuring users' privacy, safety and security	Digital solution specific; link with Ethical Requirements and All TS-DP Requirements
	Easy, reliable and fast way for the accompanying health professional to stop or pause the session at any time without scaring or disturbing the patient (by voice or tablet/button option)	Digital solution specific
	To check that the robot is at the right orientation according to the exercise's circuit before starting	Digital solution specific
	The session finishes after 15 min of inactivity or after the health professional selects so.	Digital solution specific
Alerts to the health profession	Alert in case of fall of older person	TS-G-1; FR-LS-3
	Robot should stop in case of alert from ECG or heart frequency or object in the way	Digital solution specific
	Visual alert for the health professional which do not scare or disturb the older person after detecting some events (I don't feel well, sentence not understood, fall, ECG, object)	TS-G-1; FR-LS-3
General infrastructure	To collect and store data listed in data plan	FR-HS-4
	WIFI connection	Digital solution specific
Data analysis & visualization	To recognize older person's emotion to evaluate engagement, satisfaction and suffering. Particularly, fear, joy and anger (TO MOVE TO MONITORING)	Digital solution specific
	To detect changes compared to usual/standard performance of exercise (TO MOVE TO MONITORING)	Link with FR-HS-4
Graphical Interfaces	The health professional can schedule programmed sessions for each older person (interface in tablet integrated in the robot AND/OR computer) (TO REMOVE, HERE ONLY THE INTERFACE AND IN GENERAL THE FEATURE)	FR-IS-4; FR-IS-5; FR-IS-10

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	The health professional can select/define the exercises to be given to the older person (interface in tablet integrated in the robot)	FR-IS-4; FR-IS-5; FR-IS-10
	Interface for data monitoring (computer)	Digital solution specific
	Interface for data monitoring (tablet integrated in the robot)	Digital solution specific
	Interface for data input by health profession/researcher at off-session time (tablet in robot)	Digital solution specific
	Interface for data input by health profession/researcher at off-session time (computer)	Digital solution specific
	Access in graphical interfaces should be authenticated	Digital solution specific

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Annex VI – VidAsor Project as example for the application of total conversation

CNSE

VidAsor
Videoassistance and accompaniment for deaf seniors

In 2017 the CNSE launched the VidAsor service, a service aimed at the assistance and accompaniment of the elderly deaf, a particularly vulnerable group with its own needs. Public administrations have detected a shortage of resources, programs and services that meet these needs.

This service aims to cover an important plot within the collective of deaf elderly people, accompaniment, taking advantage of the use of new technologies, and taking into account that it is a collective with little or no technological skills, the service is offered through conventional television, having internet connection and installing a specific equipment and with a web cam to the TV. The user will have the conventional channels and a specific channel of VidAsor, through which they will receive video calls from the video gamers for assistance and accompaniment.

The professional profile of video assist is that of ADECOSOR or communicative mediator, qualified personnel for the realization of this follow-up in deaf elderly people.

Communication between the professional and the deaf eldest person is made through the TELEVISION that the deaf eldest person has in his/her home to which this system has been connected in order to make that video communication with the professional who is in his/her workplace.

Being deaf people, in addition, communication with the deaf user is done directly, in sign language, without intermediaries, which offers complicity and trust to the user, important aspects also if it is an older person.

The service has 3 video speakers from 8:30 to 14.30 and from 16.00 to 20.00 from Monday to Friday, currently serving a total of 57 users.

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Users of the system will always be deaf seniors who:

- Deaf people who use sign language
- Age over 65 years, or less than 65 years that require service.
- Live alone or spend much of the day without company
- They are deaf people with serious or dependent diseases
- Have geographical isolation or social uprooting
- They suffer the risks caused by advanced age

The 2019 data reveal the importance of the service to the deaf collective, as attention has been paid to the 57 users on 3,989 occasions, 2,682 occasions as a follow-up from the service itself and 1,307 at the request of the user.

Finally, it is important that the satisfaction of the users is excellent, since for them it is a window to the outside world and for their families a tranquility and security that they did not have before. The vast majority of users believe that the service has changed their lives.

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Annex VII – Results of the Task 3.5 Requirements Surveys

Survey Technical and security requirements

Table 12: Technical and security requirements

>3,5	>3,0	>2,5	Additional requirements
Ensure that data is protected, recoverable and attributable; Employ appropriate security technologies and access logs (3,92)	Means to recognize platform components failure or other issues should be provided (event log) (3,46)	Exchange of documents (3,0)	SHAPES Digital solutions should be able to send alerts and notify the care givers when a care receiver is in a need for assistance.
Platform needs to be accessible by different user groups including disabled (3,77)	Compatibility with different browsers to be determined (3,46)	Link with existing patient profiles (2,92)	
Password management: Provide a mechanism to deal with forgotten passwords/ issuing new passwords (3,77)	Allow for different levels of complexity of the platform; develop a modular approach (3,46)	Programme logos and the top of the page should have linking options to the landing page of the respective starting page/webpage. (2,92)	
Allow for the use of mobile devices; Compatibility with IOS and android smartphones (3,69)	Health and social care needs of citizens in different conditions are not static but develop over time, as well as the response to changing care needs that the institutions might wish to provide; the platform should take this into account (3,42)	Interconnecting patient data accross communities (2,92)	
Sensors and measurement devices applied need to be recognized/registered (3,62)	Recording and retrieval of privacy consents (3,38)		

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Create capabilities to identify potential personal data breaches and identification of personal data breaches. (3,62)	Platform should make information accessible per "least-clicks" rule; a double-menu (at the top and the side) should be used to navigate (3,38)		
Enable and support the exchange of information between different tools (3,54)	Platform needs to adaptable in terms of relevant content to be displayed and appearance, i.e. fond size, contrast, etc. by the user (3,38)		
3,54 Easy to conduct updates via the platform	Ensure that the IAM (identity and access management) can be used for limiting access to certain categories of personal data and the need to restrict access to certain data is taken into consideration in SHAPES architecture. (3,38)		
	Create a process for executing data subject rights, i.e. provide information about the stored data per user, give central access to data, and allow for a centralised option to delete all data. (3,38)		
	System is continuously available even in case of disconnections from the Internet and lack of access to any cloud data centre (3,31)		
	SHAPES should adopt and use open and interoperable standards on internal and external interfaces or isolate dependencies by design to support reusability and portability (3,31)		
	Retrieve patient data (3,31)		
	Platform should resemble technologies that older people use in their everyday lifes, for example online banking (3,31)		

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	If the SHAPES platform or one of its sub-systems comes back online after scheduled or unscheduled downtime, the users should be able to see/do what they expect (system able to resume at the correct point) (3,31)		
	The different functionalities of the SHAPES platform should respond to the care ecosystem analysis that identifies the functions performed by the different actors (3,25)		
	Option to collect analytics referring to services usage (e.g. profiling on users and performance) for improvement (3,25)		
	The SHAPES platform should be able to store and retrieve large amounts of meta-data (3,23)		
	SHAPES should provide tools to simplify the installation of solutions (3,23)		
	Facilitate mobile acces to health documents (3,23)		
	Allow for key word search (3,23)		
	Allow and support the scaling up of tools, i.e. for example application within a whole country (3,23)		
	Retrieve identities/profiles (3,15)		
	Ensure critical service continuity 24/7 (acceptable downtime 2%) (3,15)		

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Survey Business requirements

Table 13: Business Requirements

>3,5	>3	>2,5	>2	additional requirements
The SHAPES Platform shall have its own Terms of Use and Services Policy. (3,88)	The SHAPES Platform shall observe universal accessibility policies (e.g., consider public authorities role related to respective subsidies). (3,47)	The SHAPES Platform Marketplace shall select its suppliers based on their offer's effectiveness, affordability and added-value to the Platform. (3,0)	The SHAPES Platform Marketplace shall contribute to the Platform's monetisation (e.g., fee per transaction). (2,41)	The SHAPES Platform should provide an open API and uses interoperability standards (e.g. IHE) so as other platforms to be able to connect with in a secure manner.
The SHAPES Platform shall have its own Privacy Policy, observing applicable regulations, including the GDPR. (3,88)	The SHAPES Platform shall consider sustainability in its design and development (e.g., economic, financial, social and environmental). (3,47)	The SHAPES Platform should foster corporate social responsibility (e.g., contribute to societal goals of a philanthropic, charitable or activist nature, by supporting volunteering or ethically-oriented practices). (3,0)		The SHAPES platform needs to be taught from proficient tutors for older adults to improve adaptability.
	Suppliers in the SHAPES Platform Marketplace shall abide and follow the SHAPES Platform's Terms of Reference, privacy policy and ethics. (3,47)	The SHAPES Platform Marketplace should contribute to the dynamics of local economies (e.g., aggregation of offers based on location and geographical reach). (2,88)		

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	The SHAPES Platform should consider the adoption of standards in its design and development, from a business sustainability perspective. (3,41)	The SHAPES Platform should implement a customer support service. (2,82)		
	The SHAPES Platform shall adopt a customer logic (B2C and B2B) in its design and development. (3,41)	The SHAPES Platform Marketplace should contribute to remove existing vendor locks. (2,82)		
	The SHAPES Platform shall be cost-affordable based on the system's modularity and configurability. (3,29)	The SHAPES Platform Marketplace shall support the registration of suppliers (supply) and of clients (demand). (2,82)		
	The SHAPES Platform Marketplace should encourage transparent competitiveness. (3,29)	The SHAPES Platform Marketplace should contribute to building economies of scale (e.g., create supply chains). (2,82)		
	The SHAPES Platform shall support various business models (e.g., direct sales, licensing, subscription, etc.). (3,18)	The SHAPES Platform shall support multiple subscription models (e.g., free, standard, premium). (2,59)		
	The SHAPES Platform shall have an online marketplace. (3,12)			

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