

OLA – Organizational Life Assistant

FOR FUTURE ACTIVE AGEING

D1.1 User Requirements and use case definition

Project Identification	
Project Number	AAL 2014-076
Duration	38 months (1 st March 2015 – 30th April 2018)
Coordinator	Carla Santos
Coordinator Organization	Inovamais, S.A. (INOVA+)
Website	http://project-ola.eu/

Document Identification	
Deliverable ID	D1.1 User Requirements and use case definition
Version/Date	V4.0 / 31.07.2017
Leader of the Deliverable	José Casquilho (CKPT)
Work Status	Finished
Review Status	Accepted

Deliverable Information	
Deliverable Description	This deliverable encompasses version A, B, C and D of this deliverable, which accommodate the user requirement methodology employed and then the results of those activities.
Dissemination Level	Public
Deliverable Type	Report
Original Due Date	M26

Authorship & Review Information	
Editor	José Casquilho / CKPT
Partners Contributing	Marco Duarte (INOVA+)
Reviewed by	Carla Santos, Marco Duarte (INOVA+), Markus Bohm, (LM)



Table of Contents

1	Executive Summary.....	5
2	Document Context.....	6
2.1	Role of the Deliverable	6
2.2	Relationship to other Project Deliverables	6
2.3	Target Audience of the Deliverable	6
3	Project Description.....	7
3.1	General Description	7
3.2	System Description.....	8
3.3	Status and Future Developments	9
4	Data collection Methodology	10
4.1	Quantitative Methodology (Seniors Visits and Questionnaires)	10
4.2	Qualitative Methodology	11
4.2.1	Focus Groups: Round-table conversation	11
4.2.2	Seniors	11
4.2.3	Informal Caregivers	12
4.2.4	Formal Caregivers	13
4.3	Analysis of Questionnaires Results.....	14
4.3.1	Seniors' Survey Results.....	14
4.3.2	Informal Caregivers' Survey Results	33
4.3.3	Formal Caregivers' Survey Results.....	56
4.4	New Requirements collected from pre-trials	70
4.5	User Requirements' List	71
5	End user engagement.....	74
5.1	Usability	74
5.2	Acceptability	75
5.3	Validation Plan	76

6	OLA Scenario	77
6.1	Task I - Typing on the touch screen of a smartphone	78
6.2	Task II – Multi-touch on a tablet screen	79
6.3	Task III – Use of online resources and technologies in Irina:	79
7	Personas and Scenarios	81
7.1	Health Scenario.....	81
7.1.1	Senior.....	81
7.1.2	Formal Caregiver	84
7.2	Well-being Scenario	86
7.2.1	Senior.....	86
7.2.2	Informal Caregiver	88
7.2.3	Formal Caregiver.....	90
8	Conclusion	93
	Annexes	94
	Annex 1	94
	Annex 2 – In depth Interviews Results – Formal Caregiver 1	98
	Annex 3 – In depth Interviews Results – Formal Caregiver 2.....	101
	Annex 4 – In depth Interviews Results – Senior.....	104
	Annex 5 – In depth Interviews Results – Informal Caregiver.....	108
	List of Figures.....	113
	List of Tables.....	115



1 Executive Summary

This document encompasses the personas and their scenarios that result from the user requirement methodology undertaken in version A and B of this deliverable, through the means of quantitative surveys and some in depth interviews. This work is structured using the information collected from three countries (Portugal, Poland and Sweden) as well as the three roles envisioned by our project objectives: end-users (seniors), informal caregivers and formal caregivers. With the version C, the analysis of the results from the surveys and the questionnaires was added, identifying the user requirements and also referring the end user engagement for the Seniors, Informal Caregivers and Formal Caregivers.

2 Document Context

2.1 Role of the Deliverable

The role of this deliverable is documenting all of the accomplishments of the user requirements' dimension of the project, which are present in the three versions envisaged for this document, namely the methodology, the documents and techniques used for the gathering of information, the results of those techniques (from the statistical point of view and also analytical) and how the project will cater to those through the means of the creation of a pre-defined set of personas and use cases that represent an ideal scenario for a life-improving active ageing using OLA.

2.2 Relationship to other Project Deliverables

Deliv.	Relation
D1.2	<p>Title: Concept Development</p> <p>D1.2 corresponds to the functional description of the OLA system, in combination with a concept design document that will be used to guide the system implementation</p> <p>Although most of the tasks of the project can somewhat be linked back to this deliverable (mostly in WP2), because it sets the needs that need to be addressed by the project using the efforts of those activities, T1.2 is the one that first and most clearly establishes a bridge between the results of D1.1 and how that needs to be implemented in the remaining tasks and stages of the project development, using functional descriptions and a draft conceptual interface development.</p>

2.3 Target Audience of the Deliverable

This document is a public deliverable. Still, it is mainly intended for the project partners and the European Commission services thus the document will be made public, but not specifically disseminated on a wider scale.



3 Project Description

3.1 General Description

This project aims to offer an answer to the societal challenges by providing an innovative Organizational Life Assistant (OLA), a virtual presence that supports instrumental activities relating to daily living needs of older adults allowing them to be more independent, self-assured and to have a healthier, safer and organized life, while easing caregivers work.

OLA will mediate and facilitate interaction (communication and collaboration) between senior citizens and their informal caregivers or other services or professionals, through technological devices such as standard computers, mobile devices (tablets) and home automation modules. These ICT (Information and Communications Technology) devices will be based on an innovative multimodal model, embracing various physical/healthy and cognitive characteristics of the older adults and will be specifically oriented to increase the level of independence of the elderly, by supporting the possibility of carers' assistance remotely and by improving the accessibility to existing services on the Web, such as on-line shopping services.

Moreover, the OLA will also provide personalized well-being and safety advices to older users in order to avoid unwanted age related health and safety situations in their own home. Such a well-being and safety advisor makes uses of a combination of user information that is collected (personal physical/health and cognitive characteristics) and extracted through emotion recognition and various sensors.


OLA also addresses a major issue that elderly face related to memory degradation and gradual decreasing of their cognitive capabilities, enabling them to remember primary health care and fiscal obligations (e.g. personal hygiene, medical and tax compliance) or helping them to find everyday items such as eyeglasses, wallet or keys. It is based on speech dialogue interfaces and space and object reconstruction and classification to capture and store daily routines and their related contexts.

The primary end-users are the big group of 65+ adults living alone with or without light physical or cognitive age related limitations, who need support from care systems. Secondary end-users are both formal and informal caregivers from public or private sectors, supporting them to cope with the increased demand for care.

3.2 System Description

OLA addresses specifically the following main issues:

- **Well-being advisor:** based on the combination of the collected user information (personal, healthy characteristics) and user interaction information (extracted through emotion recognition, sensors settings and contextual recorder capturing the routines as done by the older adult), the system will propose to the older adults personal advice adapted to their situation contributing to their preservation and well-being status in home environment. In case of risk (e.g. irregular heart rate, extreme fatigue) the system may ensure an alert to a local medical emergency service.
- **Collaborative care organizer:** based on the ISCTE-IUL and LM's knowledge of developing human-computer interaction platforms (HCI), OLA will provide online care collaboration between family and professional caregivers, by enabling a local care network to communicate, access sensor data, and coordinate care tasks. With the OLA assistant, seniors will be able to actively participate in the care organization through voice, even when they are unwilling or unable to use traditional web applications.
- **Safety advisor:** based on the combination of collected user environment information through real-time analysis and augmented reality settings, the system will propose suggestions of environment changes that interfere with accessible paths and provide alerts for intruders or other situations that can create hazard situations. In case of risk (e.g. checking intruders or fire), the system may contact local emergency services.
- **Every day instrumental daily living activities memory support:** the system will anticipate medical and fiscal compliances, remember primary health care and food requirements and could help elderly to find displaced everyday items.
- **Environment analysis:** algorithms for real-time object recognition and scene understanding will be developed based on a number of inputs (i.e. 3D object and space reconstruction by using time-of-flight and augmented reality technology) in order to analyze and decide which action to be taken in order support the elderly by suggesting environment changes and providing hints/advice for safety and accessible environments.
- **Multimodal interaction for elderly:** An adaptive organizational life assistant, a virtual presence will be developed in order to facilitating communication and collaboration between older-adults and informal caregivers or other services or professionals. This will be a user-friendly system that uses multimodal approaches based on non-invasive



and minimally obtrusive technologies (i.e. speech, silent speech, touch, gestures, RGB-D sensors).

The overall OLA system will be an easy to download and install software making use of multimodal integrated settings. OLA is in essence a service that enables the elderly user to reduce the demand of care through prevention and self-management, while at the same time also facilitating the supply of formal and informal care assistance.

A series of well-selected use cases where older adults have been supported by caregivers and care professional services will be developed, as well as pilots representing different use cases. Care units will use the system over a one year period. A new evaluation approach will be used during the pilots, investigating up to which point the OLA services alleviate caregivers support and maintain, or even improve the self-management, health and safe lifestyle of the older adult at home.

3.3 Status and Future Developments

A group of surveys and questionnaires were conducted, gathering an important information for the envisaged solutions, the personas and the respective scenarios were created to explain how a solution could address the personas issues and result to a considerable benefits for them (Version a). The scenarios needed to be restructure due to the project restructure, by shorting the scope to the Health and Well-being scenarios, as the 3D reconstruction and the augmented reality are part of research field and not to be incorporated on the envisaged solutions (Version b). The functionalities that will be seen as a concrete target to achieve will be the main focus on this deliverable, as the new scenarios, the analysis of the surveys as well the collection of requirements, will be considering the adjusted scope. After a deeper analysis for the surveys the user requirements were identified with a clear description and marked with a priority level (Version c). The analysis of the pre-pilots activities and the end user engagement was addressed focusing on the needs and expectations of the caregivers to an envisaged solutions and, in particular, the OLA solution (Version d – not in the work plan, this version follows the recommendations given during the Midterm Review). This final version includes the analysis of Sweden considerations, the original plan for piloting OLA along with Portugal and Sweden, and the Hungary considerations, the pilot location which replaced Sweden from the original plan.

4 Data collection Methodology

The first phase of the OLA Project is an analytical evaluation including gathering of information concerning user requirements, gaps, opinions on various human-computer interactions, users' context and online resources that are available for elderly citizens and could enhance elderly social life and productivity. There are two methods that will be used for collecting information directly from the selected seniors, informal caregivers and formal caregivers: the quantitative questionnaire survey method and the focus group-like, qualitative workshop methodology.

The quantitative survey will focus on the personal and the professional information of the participants. It will also be used to understand the opinion of those who might be users of our planned prototype, or have been using similar or partial AAL solutions.


The workshop methodology will consist primarily in a focus group where a discussion will be promoted between the several participants, and secondly in a technology hands-on session and is intended to reveal information on the ergonomics and efficiency of certain technical solutions and on the problems of current technology use by the elderly citizens and their caregivers.

Generally speaking, the goal of these methodologies is to gather information on user requirements, current technological gaps, and different opinions before the phase of the actual planning and functional development.

4.1 Quantitative Methodology (Seniors Visits and Questionnaires)

For the quantitative part of the survey we will use printed out questionnaires that are going to be replied in the presence and (if needed) with the assistance of a moderator. Here, our teams visit seniors, and they employ in-depth interviews based on a questionnaire to uncover user problems, challenges, needs for new solutions. Needs, functions and benefits sought by seniors are explored, not just features, and thus the most informative questions are indirect. Indirect questions yield insights into users' likes, challenges, dislikes, problems, points of pain and unmet needs.

The time demand for filling in the questionnaire is estimated at 30-45 minutes.



When seeking for senior participants we should look for such people in the specified age group (65+) who are interested in IT technologies and have some experience with devices such as mobile phones, computers and household equipment and gadgets.

Regarding the informal and formal caregivers we should look for people that already have some experience in working with senior and that have interest in IT technologies and have some experience with devices such as mobile phones, computers and medical equipment and gadgets.

The Surveys for the three end users can be accessed by the link on the *Other Annexes* section.

Note: the analysis of the results from this surveys will be only focused on the scope of this project that are going to be implemented, once the surveys include sections that are related with research only.

4.2 Qualitative Methodology


4.2.1 Focus Groups: Round-table conversation

The main goal of the round-table conversation is to reveal a large amount of information on the project's main topics. During the conversation people should be motivated to share their opinions about the different tasks performed, which modalities they used the most and what they liked the best.

Round table conversations are run with seniors and formal/informal caregivers to identify needs, wants, and problems, points of pain and suggestions for new solutions. The focus group moderator focuses the discussion on problems and wants, and helps seniors “walk through their problem” to identify areas where needs of seniors are important and not satisfied properly by currently existing solutions. Round table conversations will provide opportunities to identify problems and to drill down into these problems to identify opportunity for innovation.

4.2.2 Seniors

1. How is your relation with your current caregivers? How does it work? Who are the players?
2. How do you communicate with your caregivers? (formal and informal)
3. What happens when there is a problem/emergency?

- 
4. What do you value the most in technological devices, such as mobile phones, tablets and computers? Which of them do you use most often and for what purpose?
 5. Do you use health devices at home (e.g. blood pressure monitor, heart rate monitor, etc. ...)? Why? How are they useful? Do you store your health data, if so how?
 6. How do you feel about an app/device that would help you to monitor and communicate better with others? What jobs should it perform for you?

Questions after OLA Scenario:

1. In which way do you think that OLA's features would help you on your daily life?
2. Do you think that the OLA platform can facilitate your health monitoring?
3. Which feature is the most important to you?
4. Would you add/change any of the mentioned feature? Which one? Why?

4.2.3 Informal Caregivers

1. What is your relation with your senior patients? How does it work?
2. How do you communicate with seniors who are at your care?
3. What happens when there is a problem/emergency?
4. Which are the main difficulties in caring/monitoring senior patients?
5. Which devices do you prefer and usually use when monitoring seniors? (Why these ones?)
6. How do you feel about an app/device that would help you with monitor and communicate better with the seniors that you have in your care?
 - a. Which main jobs that app/device should perform for you?

Questions after OLA Scenario:

1. In which way do you think that OLA's features would help you?
2. Do you think that OLA facilitates senior's health monitoring?
3. Which feature is the most important to you as informal caregiver?
4. Would you add/change some feature? Which one? Why?



4.2.4 Formal Caregivers

1. What is your relation with your senior patients? How does it work?
2. How do you communicate with seniors that are at your care?
3. What happens when there is a problem/emergency?
4. Which are the main difficulties in caring/monitoring senior patients?
5. Which devices do you prefer and usually use when monitoring seniors? (Why these ones?)
6. How do you feel about an app/device that would help you with your communication with the seniors that you have in your care?
 - a. Which main jobs that app/device should perform for you?

Questions after OLA Scenario:

1. In which way do you think that OLA's features would help you?
2. Do you think that OLA facilitates senior's health monitoring?
3. Which feature is the most important to you as formal caregiver?
4. Would you add/change some feature? Which one? Why?

4.3 Analysis of Questionnaires Results

4.3.1 Seniors' Survey Results

The Senior Questionnaire is divided into seven parts:

- A. Social Demographic
- B. Housing Situation*
- C. Health /Clinical Data
- D. Basic Activities of Daily Life
- E. Security*
- F. Technologies Access
- G. ALL Devices

*The sections marked belongs to research only, as the results will not be part of this analysis.

A. Social Demographic

This data collection target three European Countries: Poland, Portugal and Sweden from 62 participants (22 from Poland and 20 from both Portugal and Sweden).

For this research, the Female Gender was more popular than the Male Gender, with approximately 66% against 34%, respectively.

The age range is above 60 years, the most frequent age is 65. However, the age average for this research is 75 years old.

The marital status of the participants was evaluated to determine if the persons are sharing with someone closer and present their daily life.

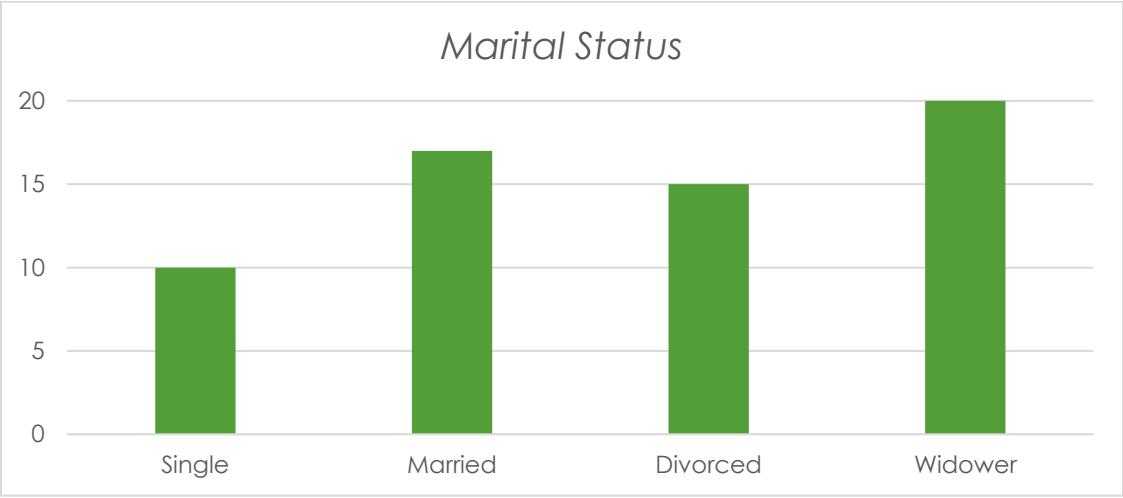


FIGURE 1- MARITAL STATUS

Only 26% of the seniors are married and have at least someone to not feel lonely at home and at their outdoor activities and to contribute somehow to their happiness and integration in society. This numbers must be analysed together with whom the seniors is living in the household, in order to compare with whom (figure 2) and how many (figure 3) persons they have daily contact, even if not a uninterrupted one.

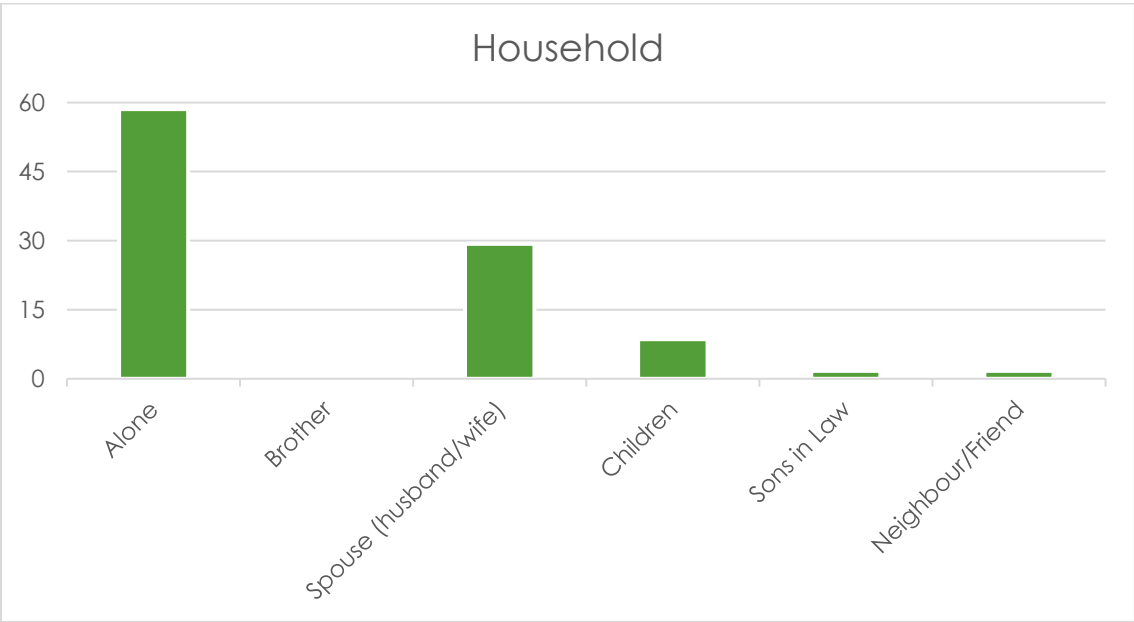


FIGURE 2- HOUSEHOLD

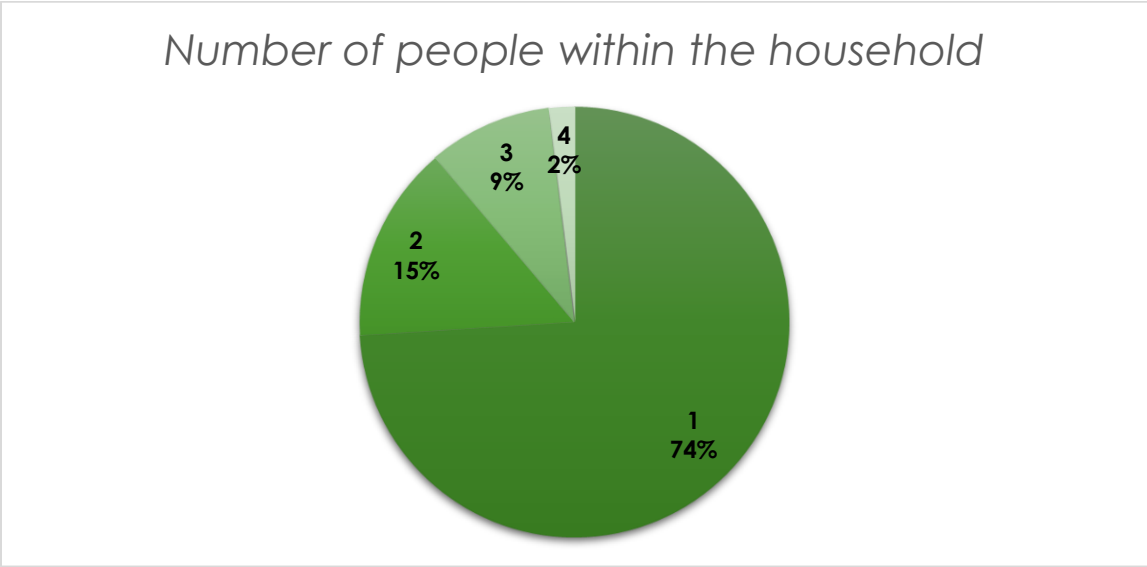


FIGURE 3- NUMBER OF PEOPLE WITHIN THE HOUSEHOLD

From these two last figures it is evidenced that the seniors at the most of the cases whether live alone or only with their spouse. At a very low percentage, seniors are living with their sons or sons in law. The ones which are not living alone, are living only with one family member or friend. These results emphasise the trend to these seniors loose (at least physical) contact with their relatives and other closest persons being more disconnected from the ones they care, and unfortunately more dependent on those to deal with the more important matters as appointments at health services and regular health evaluations.

B. Housing Situation

Most of the seniors, above 80%, consider that they are living at excellent or good conditions, with only approximately 11% are living in a special housing for the elderly (care available for 24 hours), also a few percentage are living in a house and 74% live in an apartment.

Requirement #1: A solution to provide a permanent contact with senior's relatives and friends.

The followed addressed questions from the questionnaire are only for research matters.

C. Health/Clinical conditions

This questionnaire section evaluates the health condition of the seniors and tries to identify which are the major issues and their associated needs. As illustrated on the following Figure, more than half of the individuals are unhealthy.

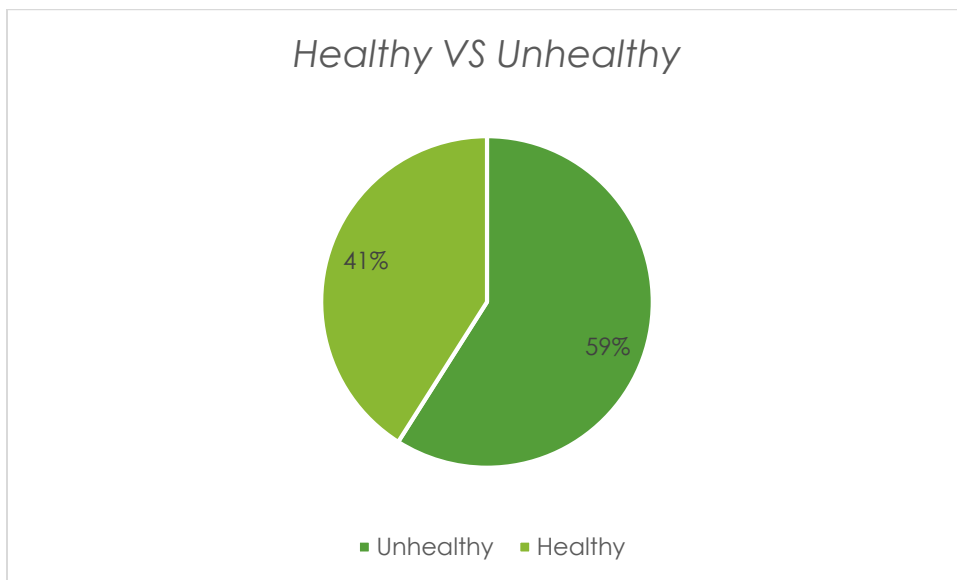


FIGURE 4- HEALTH STATUS

Starting from the sample of the unhealthy seniors, the actual health status results have a similar percentage on seniors in recovery and the ones which are facing an acute disease (as cerebrovascular accident, rheumatism, pneumonia or other) with nearly 18 % on each, while the number of seniors pertained to the chronic disease gets the larger slice from the results (such as Diabetes, cancer, obesity or respiratory disease) with 64% on the unhealthy identified seniors.

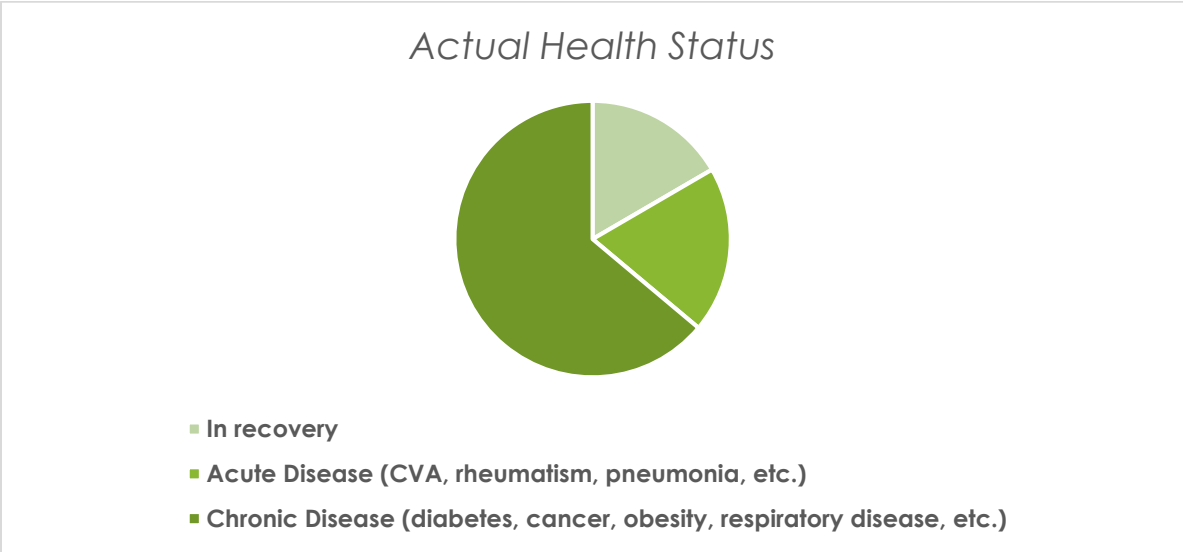


FIGURE 5- ACTUAL HEALTH STATUS

The chronic diseases are the most common issue gathered from the actual health status of the participants. The following figure represents which chronic diseases are more prevalent from the seniors that participated on the data collection, ordered by number of diseased individuals.

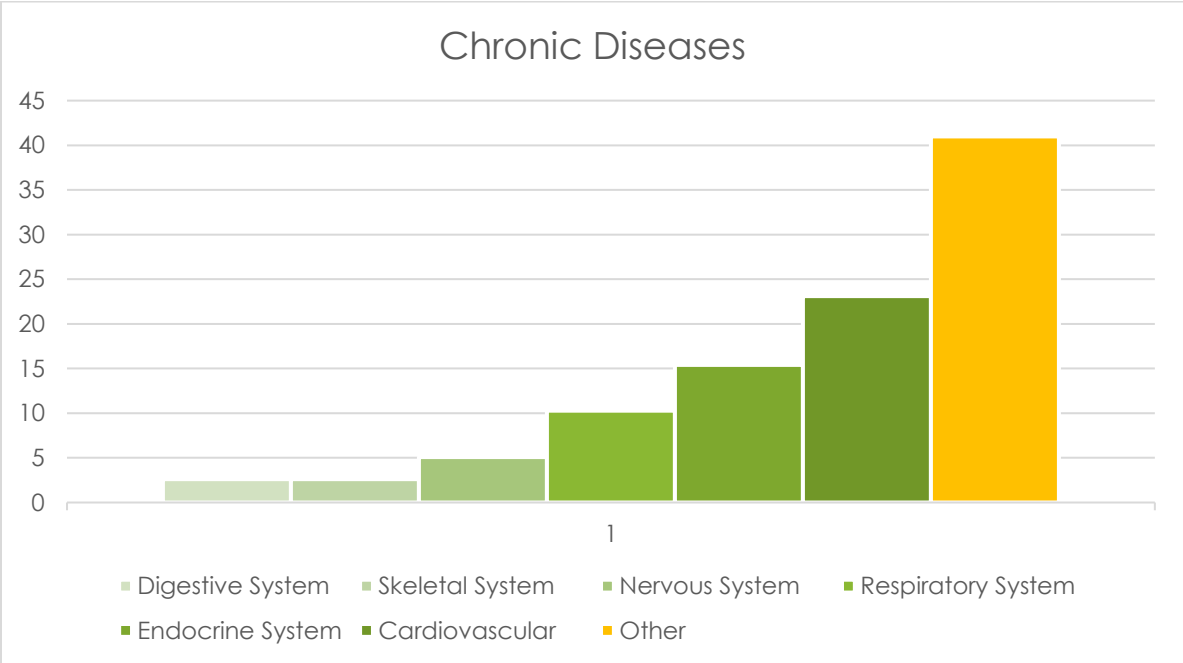


FIGURE 6- CHRONIC DISEASES

The OLA service should respond to some diseases pointed here providing measurements for glucose, weight and blood pressure to evaluate the health status and also to avoid their diseases to grow or prevent to be diagnosed with others.

Requirement #2: A solution to evaluate the chronic diseases.

Requirement #3: A solution to prevent new chronic diseases.

The cognitive status of the seniors were evaluated to identify what are the levels of difficulty they feel about forgetting activities or events, getting lost at a place, getting lost on a time or daily problems and their management – and by each issue could be rated on importance to have a solution to minimize that difficulty. The cognitive status in memory, Spatial Orientation, Temporal Orientation and the Judgement and Problem Resolution can be analysed on the following figure:

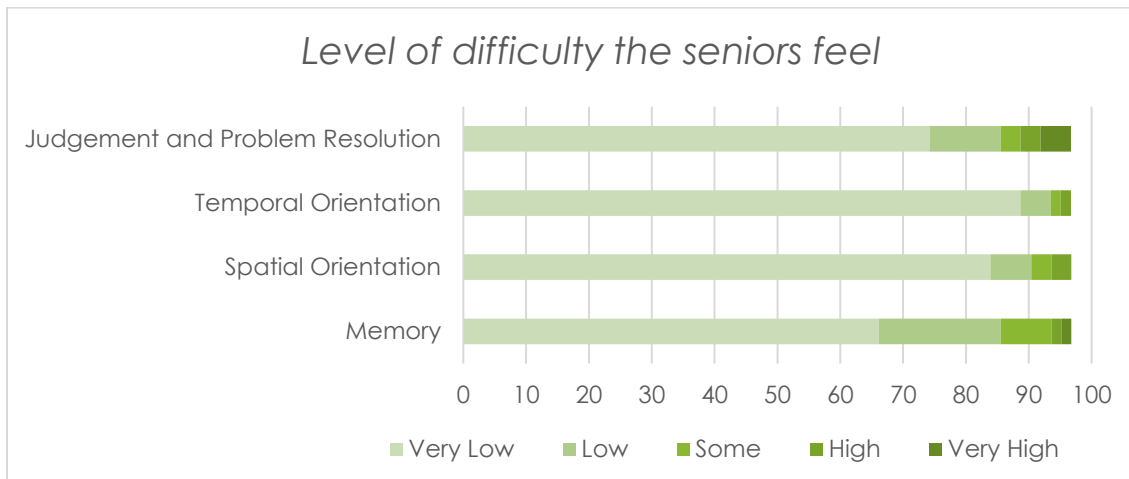


FIGURE 1

FIGURE 7 – COGNITIVE STATUS - LEVEL OF DIFFICULTY THE SENIORS FEEL

On the analysis from the Figure 7, the majority of the seniors do not have a high level of difficulty in general aspects of the cognitive status, stating more difficult on remembering memories and resolving judgement and problems/business affairs.

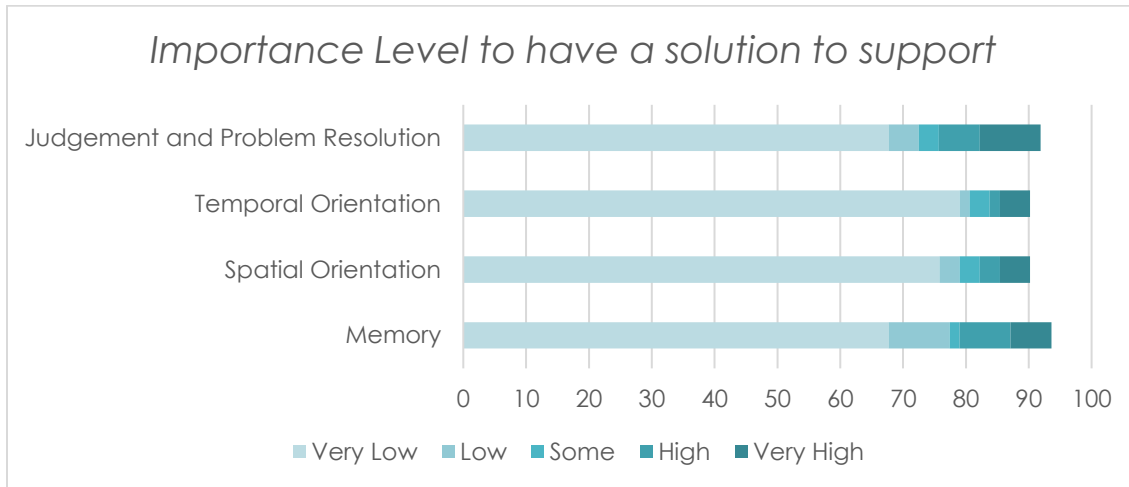


FIGURE 8– COGNITIVE STATUS - IMPORTANCE LEVEL TO HAVE A SOLUTION TO SUPPORT

The major aspects where the seniors identify some levels of difficulty are related with Memory and Judgement and Problem Resolution. Considering these two aspects which are limiting at some point the seniors on their daily activities and also affecting their psychological well-being, an additional requirement was identified.

Requirement #4: A solution should be a memory support, helping seniors to remember appointments of personal and other topics of interest.

In a similar way asked for cognitive status of the seniors, the surveys evaluate the Health Care needs – assessing the level of difficult the seniors feel about monitoring different health care status together with the importance to have a solution to minimise that same difficult level.

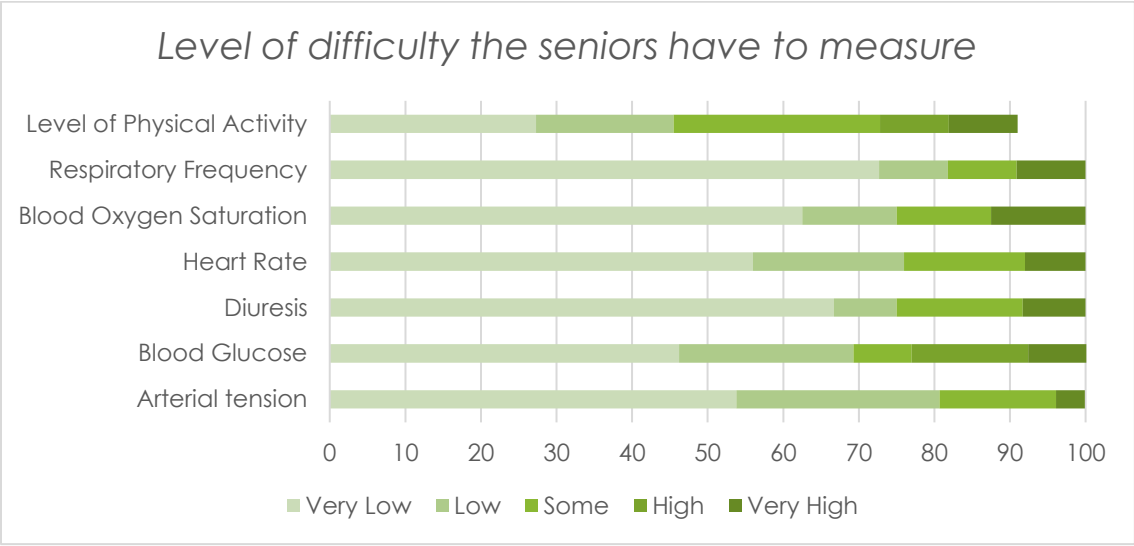


FIGURE 9- HEALTH CARE NEEDS - LEVEL OF DIFFICULTY THE SENIORS HAVE TO MEASURE

The seniors reveal more difficulty on monitoring their level of Physical Activity, the Blood Glucose, Arterial Tension and Heart Rate. On the other way, they reveal less difficulty on measuring the Diuresis and the Respiratory Frequency. The Figure 10 illustrates the importance to have a solution to support the measurement of these health care needs

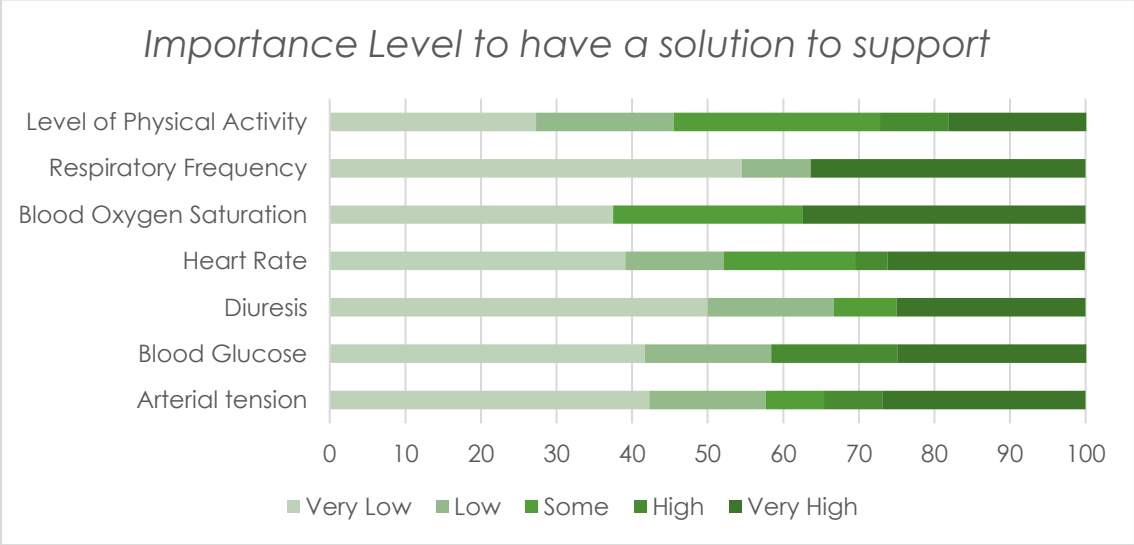


FIGURE 10- HEALTH CARE NEEDS - IMPORTANCE LEVEL TO HAVE A SOLUTION TO SUPPORT

The seniors have expressed their willing to have a solution which could support the Health Care needs which they have more difficulty adding the Blood Oxygen Saturation.

Following the seniors preference on a solution which could offer a support for the measurements which they have more difficulty to measure, four requirements based on the seniors' needs are listed below.

Requirement #5: A solution to easily measure the Physical Activity.

Requirement #6: A solution to easily measure the Blood Glucose.

Requirement #7: A solution to easily measure the Arterial Tension.

Requirement #8: A solution to easily measure the Heart Rate.

The Physical Activity and Arterial Tension measurements will require the use of a band to collect data from users (such as steps and calories burned) and send this information to the solution, which can be later reviewed, analysed and shared among caregivers and family/friends.

The Blood Glucose and Heart Rate measurements will require specific devices with Bluetooth to able to send the collected user's data to the solution, for the same means as the Physical Activity and Arterial Tension.

The seniors were asked to express their difficulty level to access different Expert Care Supports, including the Units of Doctor, Nurse, Physiotherapist, Psychologist and Social Assistant. The seniors reveal that they have more difficulty to reach the Physiotherapist, Nurse and Doctors as it can be analysed from the results on the following figure 11.

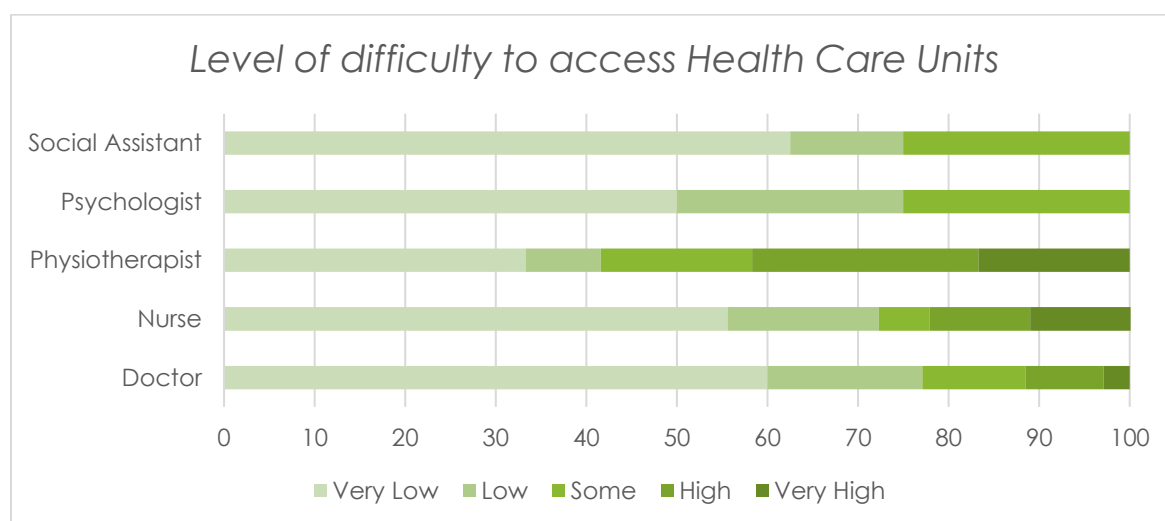


FIGURE 11 - HEALTH CARE UNITS – LEVEL OF DIFFICULTY THE SENIORS HAVE TO ACCESS

The seniors express a preference on the same Health Care Units to be easier contacted over a solution.

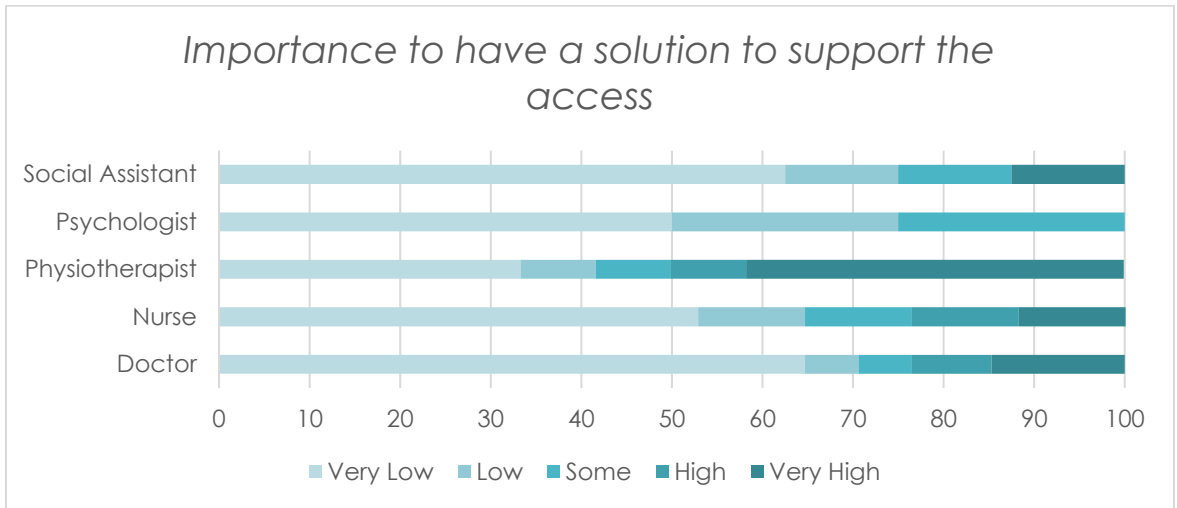


FIGURE 12- HEALTH CARE UNITS – IMPORTANCE TO HAVE A SOLUTION TO SUPPORT THE ACCESS

Based on this results, a new requirement for the OLA solution is added, providing an easy way to contact Health Care Units.

Requirement #9: A solution that eases the access with Health Care Units, including Physiotherapists, Nurses and Doctors.

The seniors were also asked to express their difficulty level to access different Health Care Services, including Health Centre, Pharmacy, Nursing Centre, Rehab Centre and Hospital / Clinic, followed by the level of importance to access these services on Figure 13 and 14, respectively.

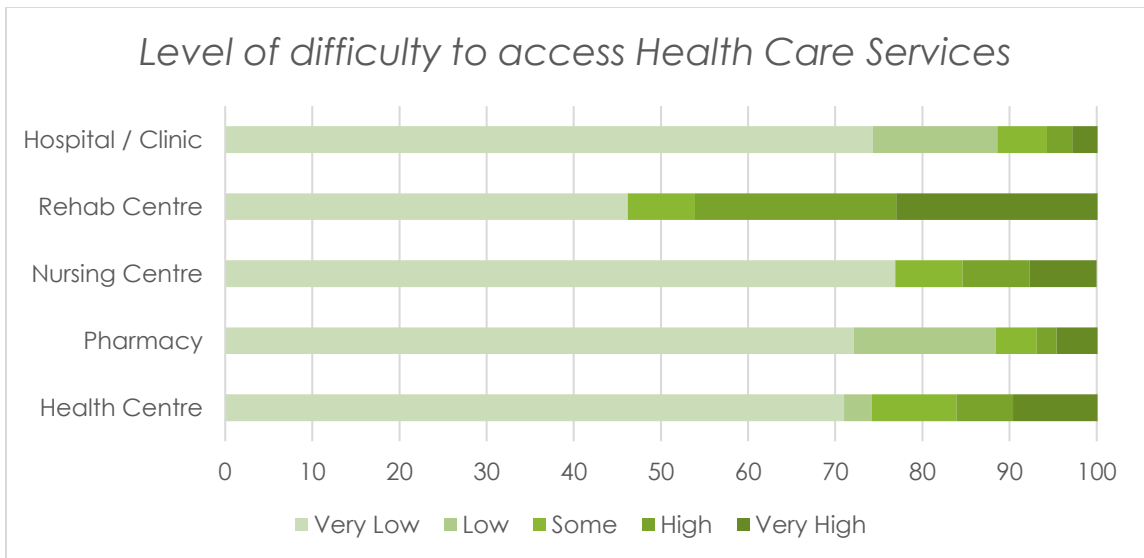


FIGURE 13- HEALTH CARE SERVICES - IMPORTANCE TO HAVE A SOLUTION TO SUPPORT THE ACCESS

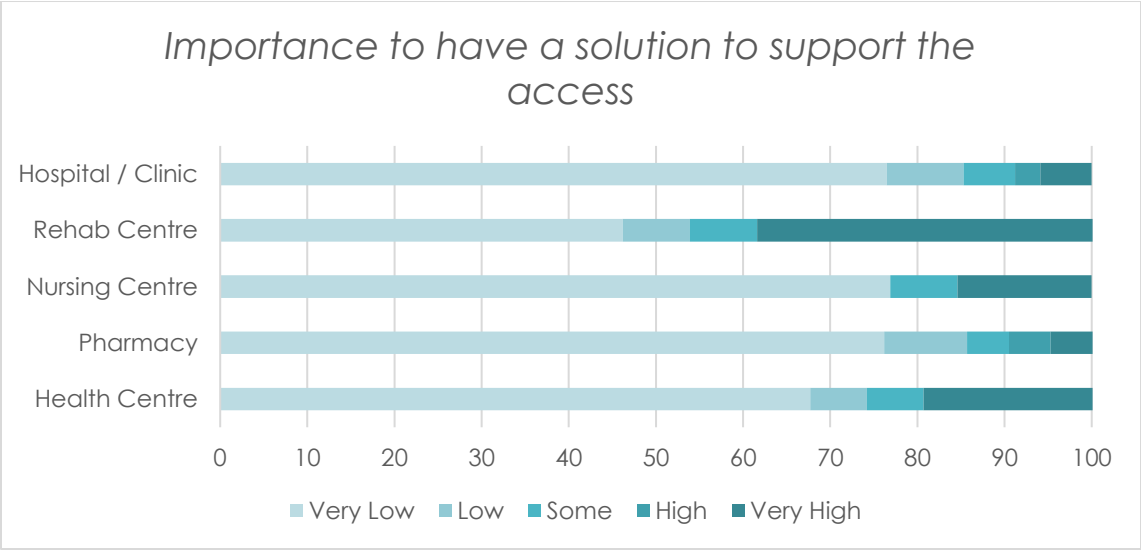


FIGURE 14- HEALTH CARE SERVICES – IMPORTANCE TO HAVE A SOLUTION TO SUPPORT THE ACCESS

The service identified as the most difficult to access when needed and which would be seen as a great advantage for a solution is the Rehab Centre, follows by the Health Centre.

Requirement #10: A solution that enables direct contacts with Rehab and Health Centres.

The following analysis centers on the preference for seniors to make a help request in case of needing help (Figure 15) and more precisely to whom they would require that help assistance (Figure 16), both ordered by preference

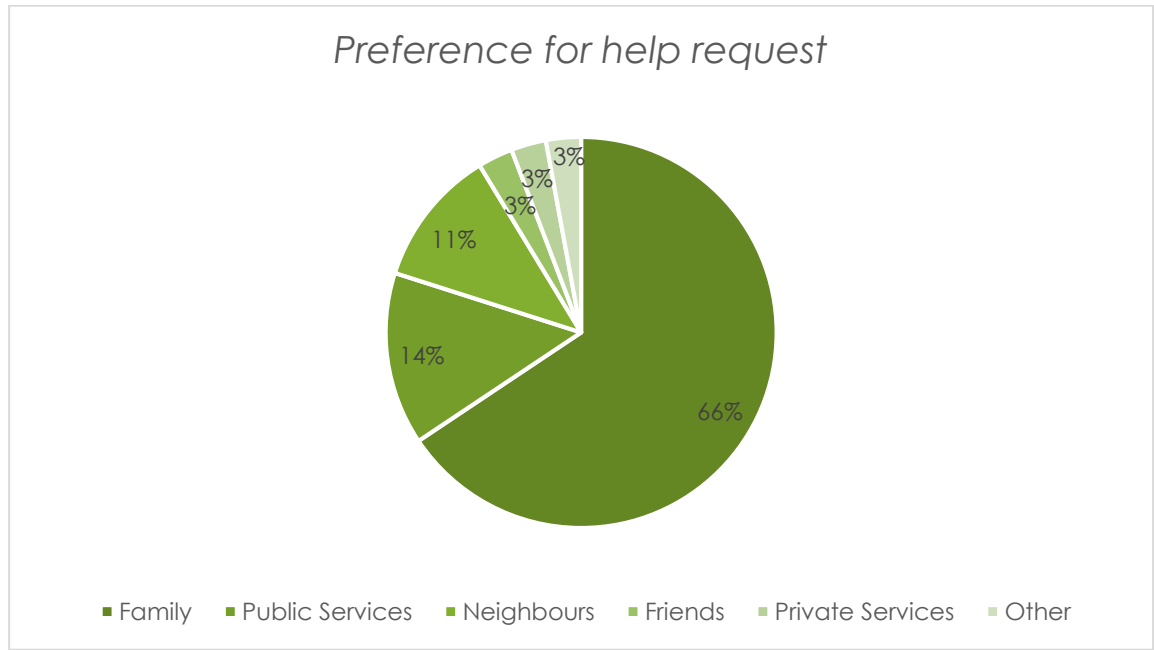


FIGURE 15– PRIORITY FOR REQUESTING HELP

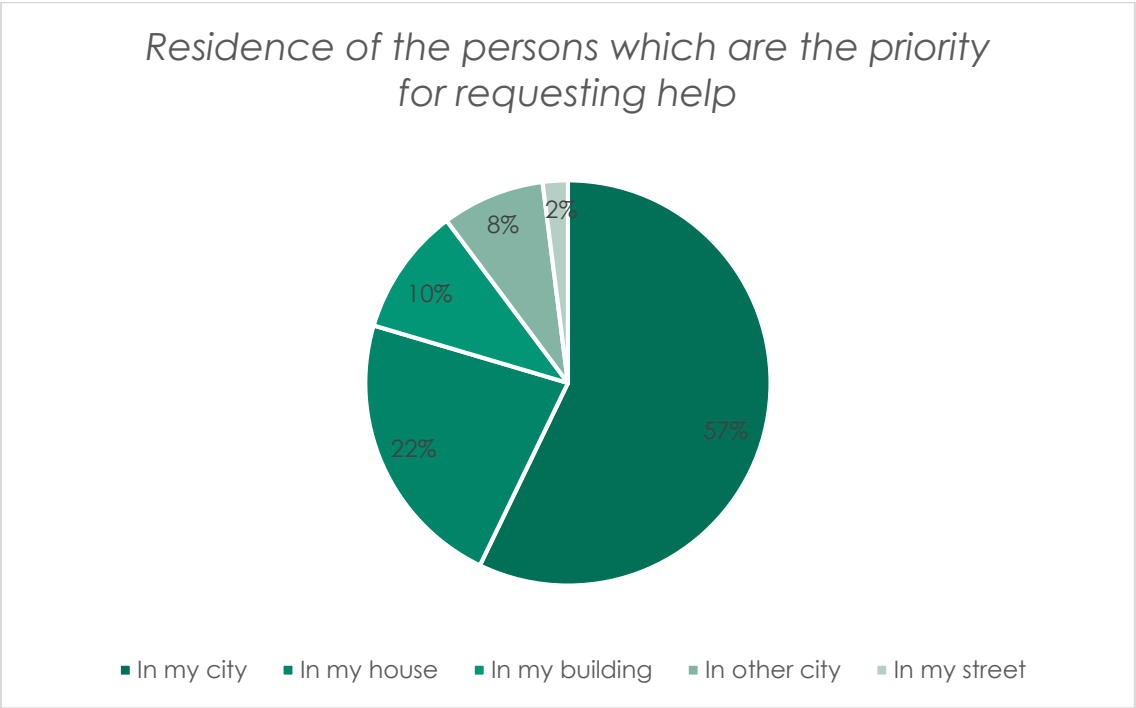


FIGURE 16- RESIDENCE OF SENIORS' PRIORITY FOR REQUESTING HELP

The figure 15 demonstrates that seniors have chosen Family as their main priority to request help assistance, followed by Public Services and Neighbours. The most interesting and relevant results from the Figure 16 is that seniors did not have their preference to

request help based in the proximity of their priorities (for help request), as they prefer to contact persons which are at their respective city as their main priority, relegating persons at their house or at the same building.

This questions reveal that prefer to contact persons which are more connected to them of easy access like Family, Public Services or Neighbours which does not need to be a few steps away.

Technologies access

The two following figures represents whether the seniors own different types of technology, including Fixed Phone, Smartphone, Computer and Internet. The seniors are more dependent or keen to use fixed phone rather than mobile phone, while the use of computer and internet are equally dispersed.

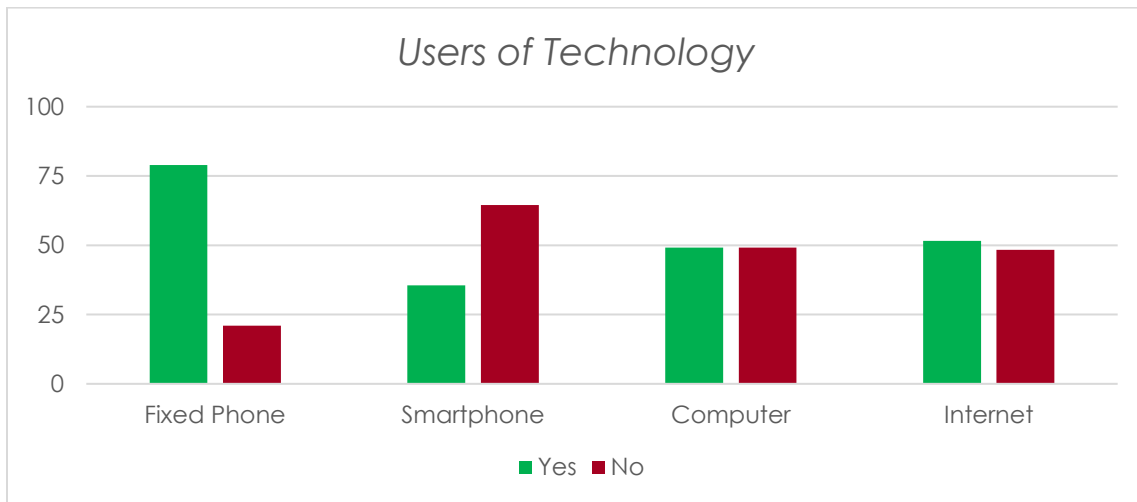


FIGURE 17- USERS OF TECHNOLOGY

The following Figure (Figure 18) illustrates the use frequency of the respective technologies mentioned on the previous figure.

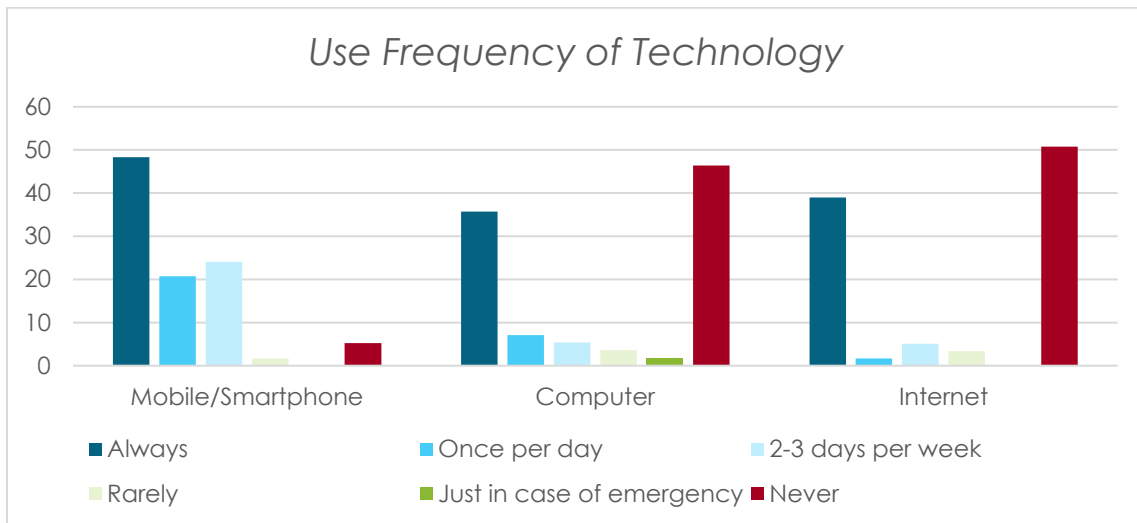


FIGURE 18- USE FREQUENCY OF TECHNOLOGY

This Figure represents that the great majority of the seniors use the mobile at least 2 or 3 days per week, and a significant number of seniors to use the mobile/smartphone always. The most of the seniors that own each of these technology expressed their strong use of those. Due to their lack of use frequency on technology simple and helpful technologies should be implemented to ease their methods for communicating.

Requirement #11: The service must enable online communication to their two major priorities – Family and Public Services with touch and speech integration.

D. ALL Devices

The participants on the surveys were questioned the knowledge and use of devices, for example the glucose concentration in the blood, balances that keeping record of the weight of the person over time, hearing aids, remote controls appropriate for people with limited dexterity, heart rate meters with the possibility of sending data remotely to health care providers, emergency buttons with integrated GPS.

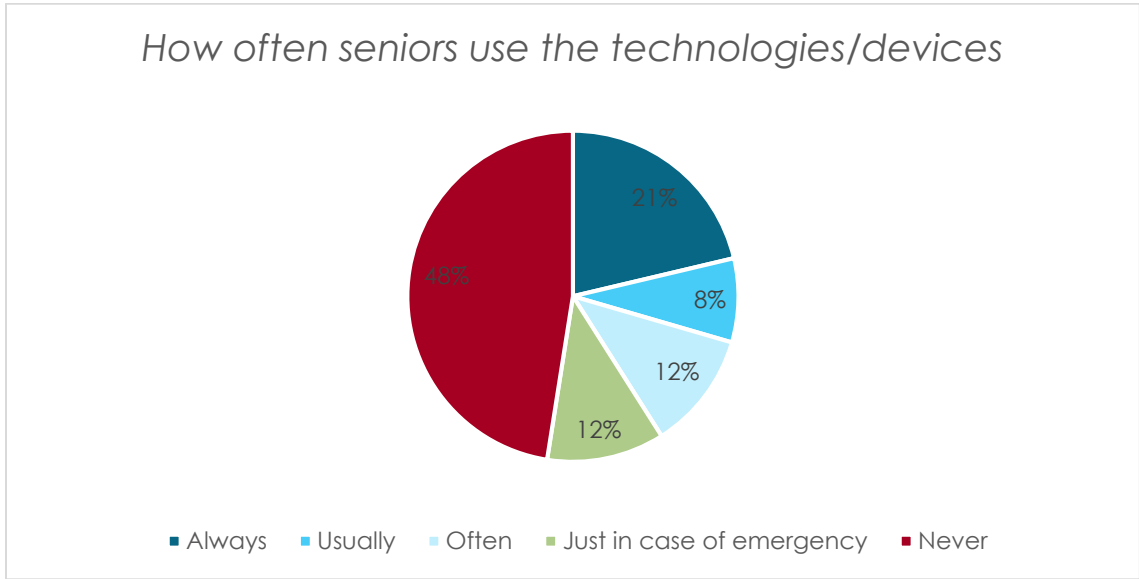


FIGURE 19– HOW OFTEN SENIORS USE THE TECHNOLOGIES/DEVICE

According to this last, the majority of the seniors never have used the technologies and devices or just in case of emergency. There is still a considerable number of seniors who have not used technologies.

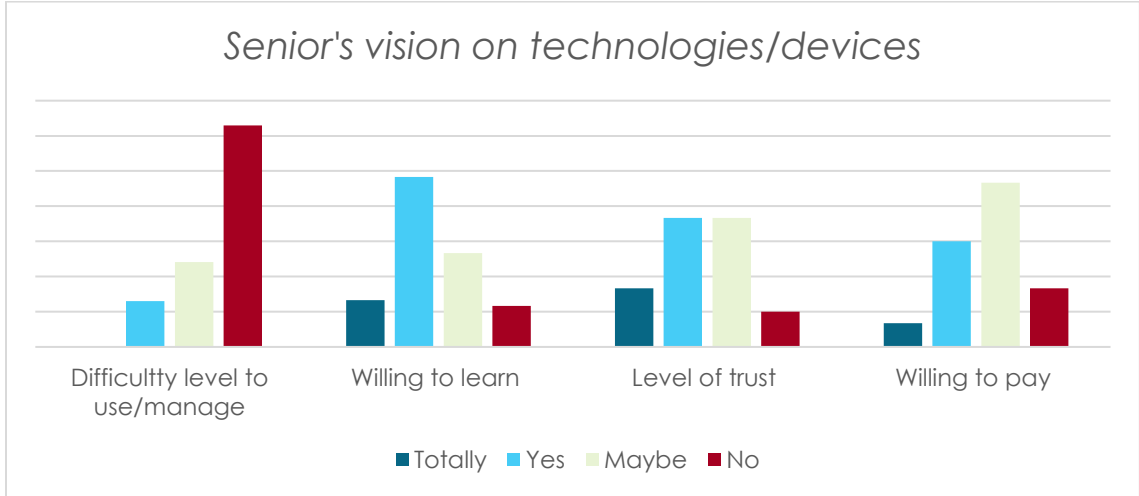


FIGURE 20- SENIOR'S VISION ON TECHNOLOGIES/DEVICES

In spite of the difficulty expressed by the seniors on using these technologies/devices, the majority of the group of the participants answered that they are interested to learn how to use those technologies and devices. OLA service must offer an easy way to interact with the user, with simple and fast commands during the interactions between the seniors and the platform. The last three figures' analysis reinforced the importance to develop a

simple application that offers the minimum level of difficulty and commands which can not only simplify but accelerate the senior's interaction with OLA.

Requirement #12: A platform with a simple and easy to use application, considering a significant lack of knowledge on technology by silver age citizens.

Requirement #13: Develop a robust security platform, where the seniors' data can be safely stored and users be able to recognize a trustful and secured solution.

Concerning the user's willing to pay for a solution to manage their health data, the majority of the participants answering that maybe they can spend some money on a solution – the likeliness of the users ending to become willing to pay are tied to the fact that the solution must be easy to use, to have a trustful data protection platform and to offer a reliable system for data measurements. For a more precisely senior's perception on a reasonable monthly fee which they would be willing to pay can be analysed on the next figureer.

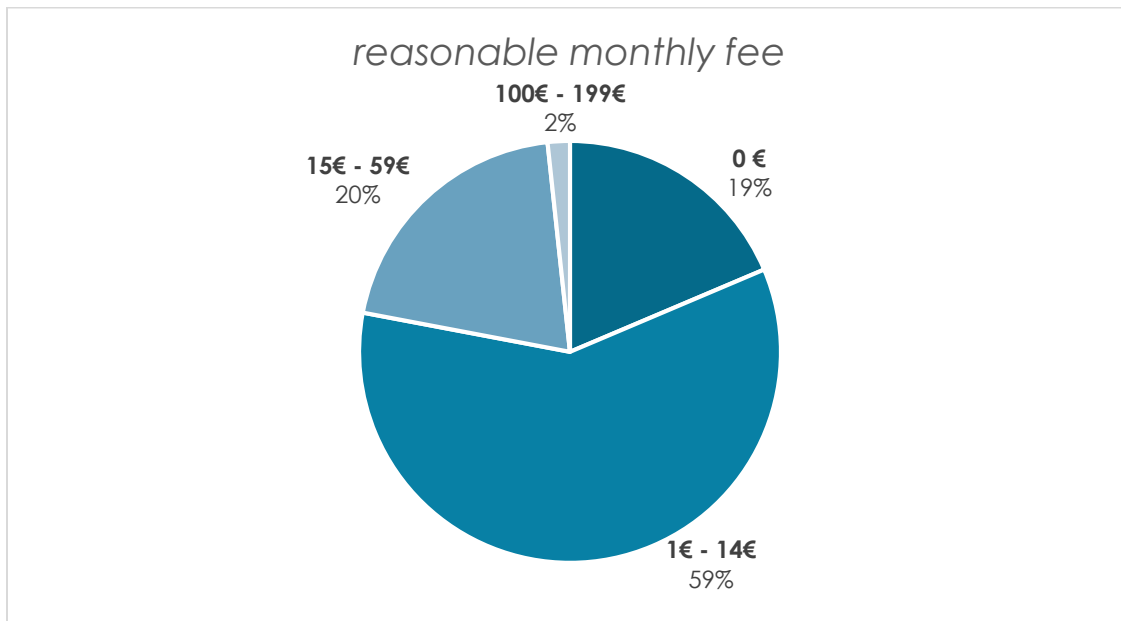


FIGURE 21 - REASONABLE MONTHLY FEE FOR THE SENIOR'S PERSPECTIVE

Nearly 80% of the seniors marked 14 Euros as the maximum monthly fee which they were supposed to spend on a solution which would help them to monitor their health data and also ease their communication with their caregivers, family and friends. The seniors which are willing to spend more than 14 Euros or more are 22%, on which 2% of those are willing to spend 100 Euros or more.

The questionnaire ends with a group of questions to the seniors about themselves and, more precisely, their feelings on being an old age person and it influences the perception of others when they use technologies – including how other persons act with them, a worry that others will view their behaviour as being stereotypic of old age, stereotypes about old age can affected them personally, the attribution from others on a poor performance due to their age, the ability to perform well with technological devices being affected by age and a worry that others can judge badly their performance due to their age.

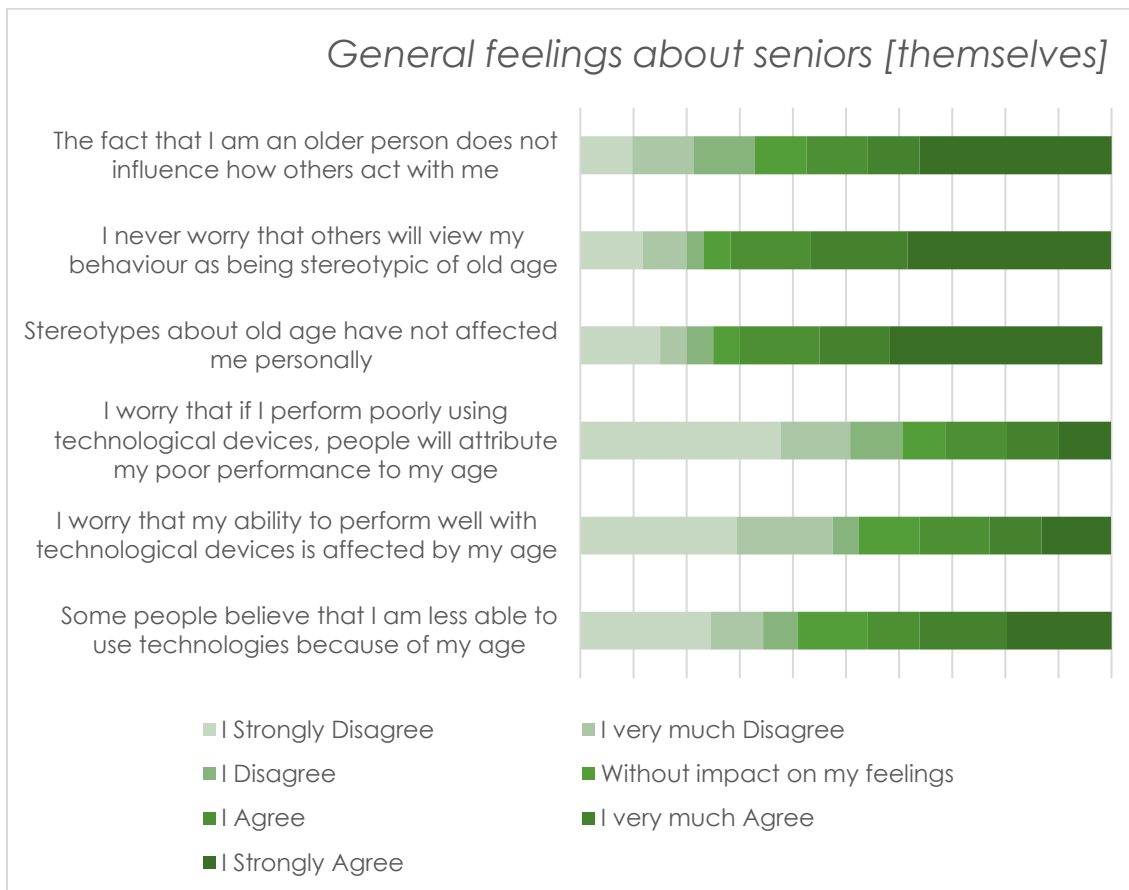


FIGURE 22- GENERAL FEELINGS ABOUT SENIORS

From the Figure 22, the seniors reveal that:

- the fact of being an older person it does not influence how others act with them, normally they do not worry that others will view their behaviour as being stereotypic of old age and the stereotypes about old age slightly affect them;
- they are nothing worry that they perform poorly using technological devices, people will attribute that to their age;

- their age can be a factor for impacting their ability to perform well with technological devices as to the perception of people to them for being less able to use technologies.

The following figure will evaluate the seniors view on rating the group of older, in terms of competency and friendliness.

Requirement #14: The use of technology with the platform must help to integrate seniors and feel more part of society.

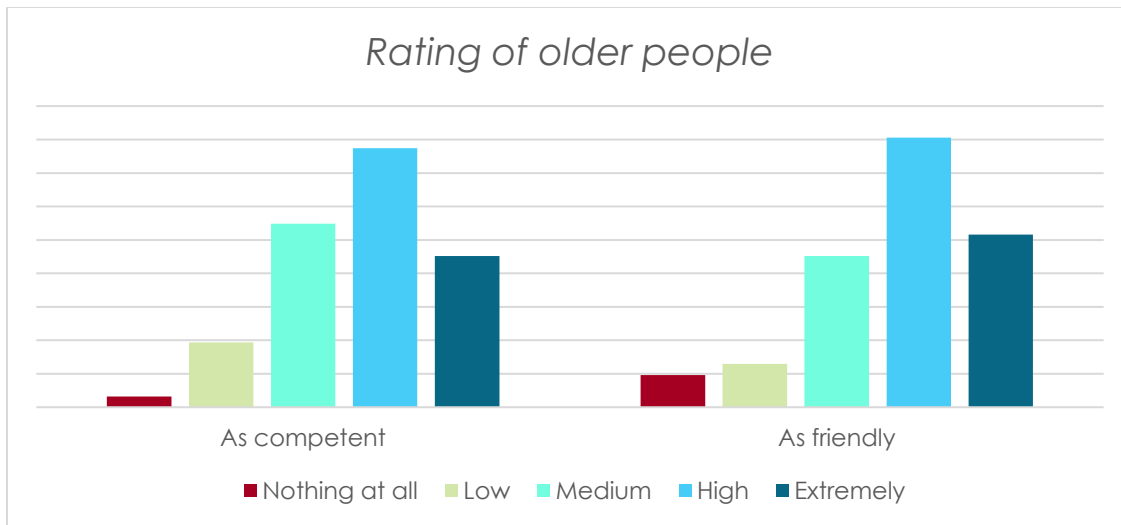


FIGURE 23- RATING OF OLDER PEOPLE

The Figure 23 demonstrates, in respect to competency and friendliness, the majority of the seniors consider the group of older people having highly or extremely level on both aspects. There is still some seniors which still consider that older people have some / less competent and friendly; a very low number of seniors consider that older people cannot be as competent and friendly as persons which are not considered older age persons. The following and last figure, analysis the perception of the seniors on older people and their feelings to be part of this group.

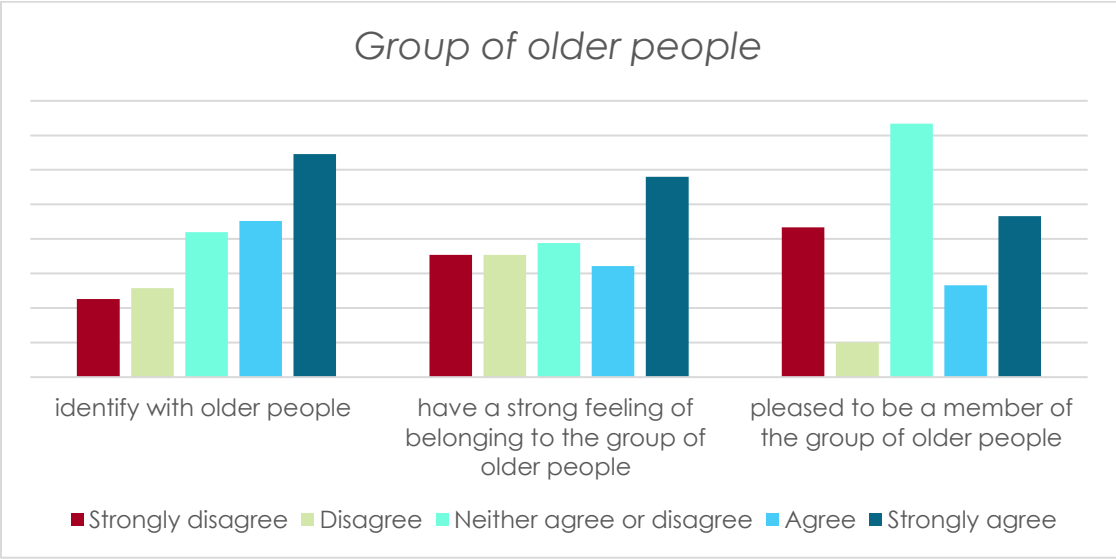


FIGURE 24 - GROUP OF OLDER PEOPLE

A great number of seniors are identified as part of older people’s group and a great perception of belonging to this group. Nevertheless, their satisfaction on belonging to the group of older people, as it can be seen on the last graphic on the right, is more dispersed.

Requirement #15: A solution to support on the necessity of keeping older adults independent and actives in their homes.

4.3.2 Informal Caregivers' Survey Results

The survey for the Informal Caregivers have the following structure:

A – Social Demographic

B – Care Data

C – Social Demographic Data of the People in your Care

D – Services

E – New Technologies

F – General Feelings

A – Social Demographic

Occupation of the Informal Caregivers is the first criteria analysed from the surveys, and the respective results can be analysed on the Figure 25.

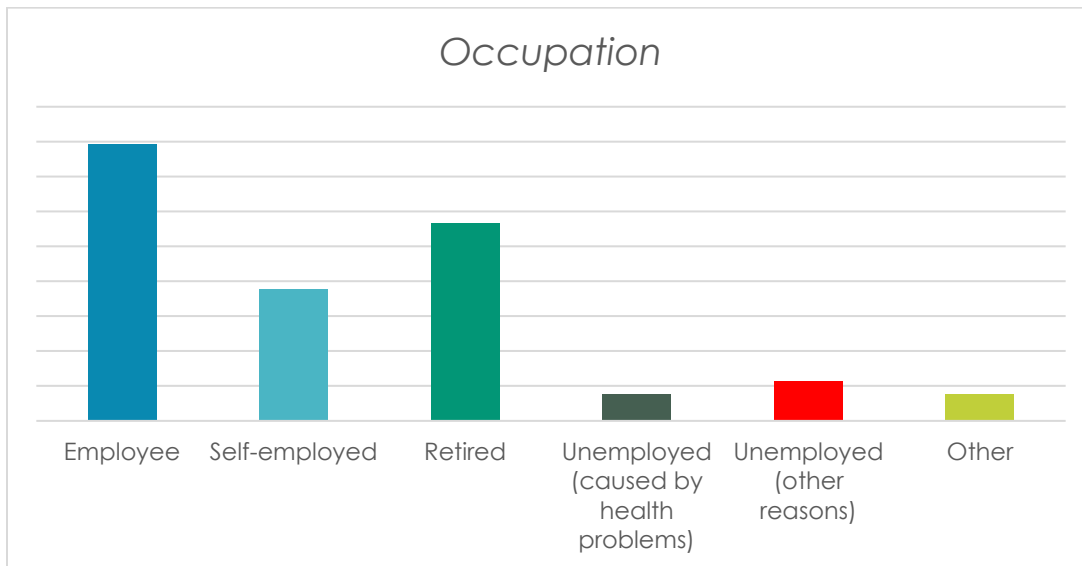


FIGURE 25- INFORMAL CAREGIVERS' OCCUPATION

The survey results demonstrated that the areas of residence where the caregiver works at mostly (80%) at urban areas and Semi-urban (11%).

B – Care Data Questionnaire

The frequency of work is analysed first in respect to the Care data of Informal Caregivers

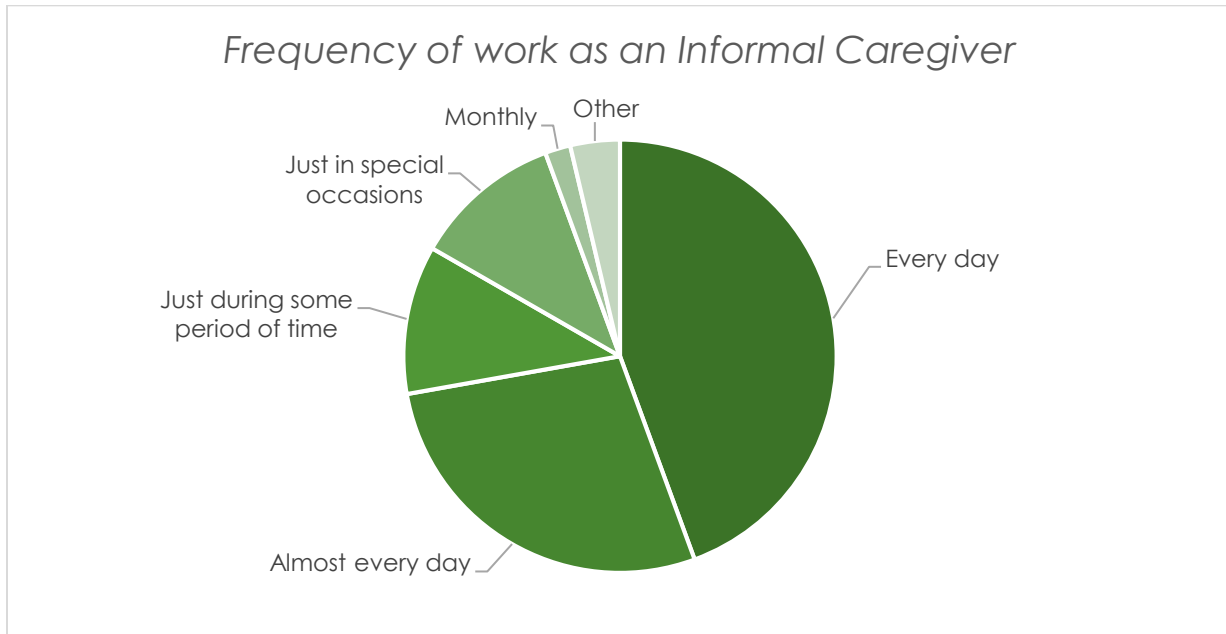


FIGURE 26- INFORMAL CAREGIVERS' WORK FREQUENCY

In the case Informal Caregivers are taking care of more than one person, the productivity of the Caregivers is analysed on the Figure 27, results are analysed below.

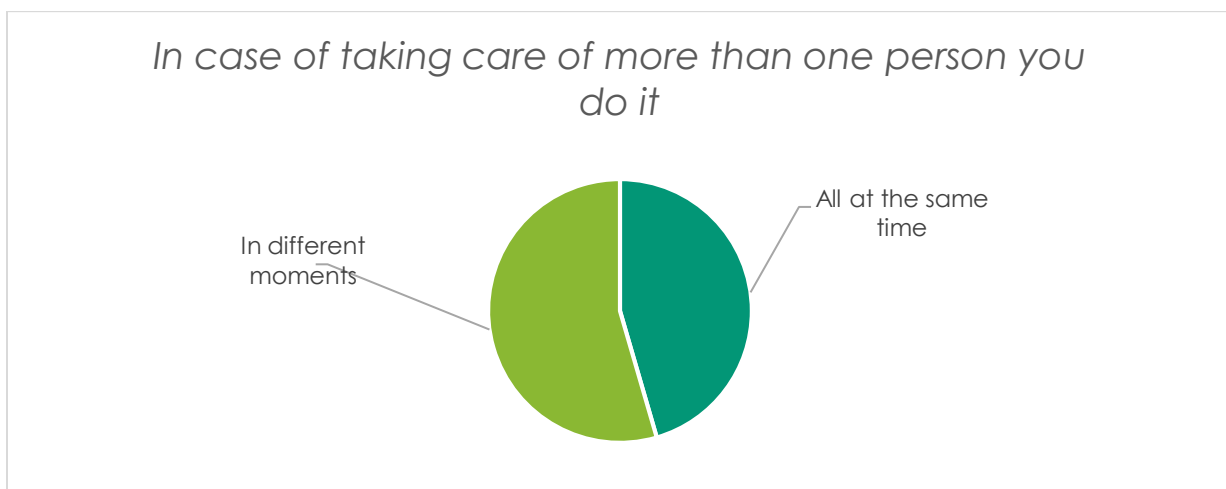


FIGURE 27- TAKING CARE OF MORE THAN ONE PERSON

As the Figure 27 illustrates, there is still a high percentage of caregivers that are taking care of persons individually, in fact, this percentage is greater than the caregivers which are taking care of persons all at the same time. A solution which enables a simultaneous

assistance of various persons, will save time both for the informal caregiver and for each senior on his/her care.

Both from Figure 26 and 27, the solution can improve the Caregiver's productivity, saving time on the assistance by avoiding time of journeys and giving the possibility to evaluate the results and give feedback to the senior's at any time of the day, with the advantage of doing that in a simultaneous way for more than one senior at the time.

Requirement #16: A solution designed for enhance the Caregivers' efficiency, by providing them the possibility to evaluate the seniors' results and give feedback simply and fast.

The relationships more common by the informal caregivers with the seniors are by taking care of their parents (39%), sons (20%) and spouse (13%).

The informal caregivers in most of the situations does not live in the same house as his/her senior, with the results expressing a significant despair of 62% and 38%, respectively.

The percentage of receiving any kind of support from institutions when working as a caregiver is just a little higher comparing to the percentage on the cases when that support is not provided, 56% against 44% respectively. The Figure 28 illustrates the level of support provided by the different institutions, including Hospital, Night Care Center, Home for the Elderly, Residence, Health Center, Home Support Service, Day Care Center, Social Center.

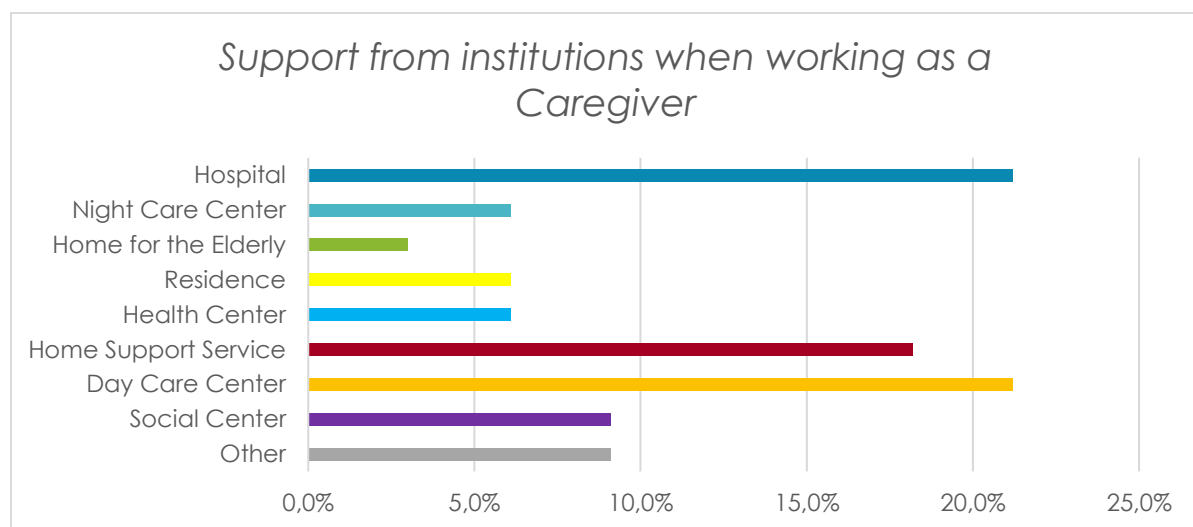


FIGURE 28- SUPPORT FROM INSTITUTIONS WHEN WORKING AS A CAREGIVER

The Hospitals, Home Support Service and Day Care Center are the three institutions that provide more support to the persons that work there as a Caregiver.

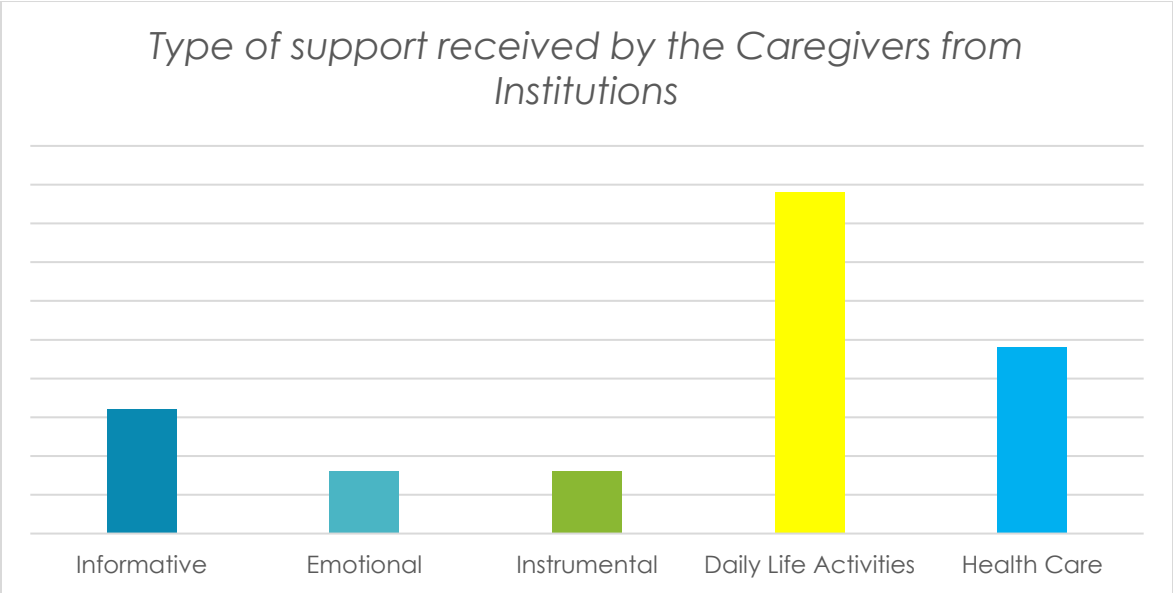


FIGURE 29- TYPE OF SUPPORT RECEIVED BY THE CAREGIVERS FROM INSTITUTIONS

While Daily Life Activities and Health Care support are more frequently requested/provided, the Informative, Emotional and Instrumental types of support are less common. The solution to be designed will have Instrumental and Informative support for the Caregivers feel comfortable using the solution and providing the necessary support to the seniors.

Nearly a third of the Caregivers answered that they have to pay the Institutions for received that same support, as the demonstrated results on the figure 30.

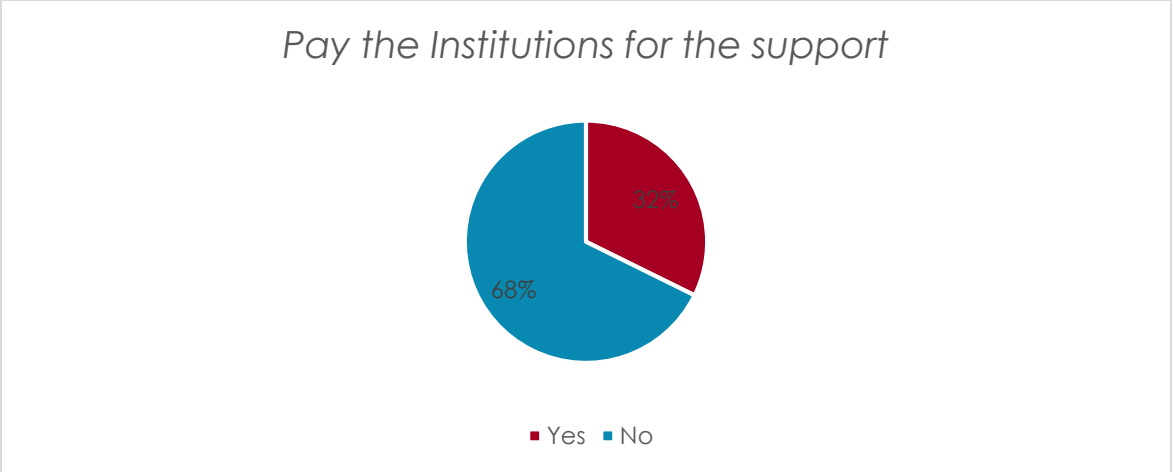



FIGURE 30- PAYABLE SUPPORT FOR THE CAREGIVERS TO INSTITUTIONS



According to the analysis made from the previous two Figures, the solution should offer standard metrics for each equipment, assisting the Caregivers on the time they are analysing the senior's health data results, reducing costs for Caregivers.

Requirement #17: A solution to reduce Caregivers' costs on providing them support both Technical (all functions available to analyse results and communicate with patients) and Medical (interpretation of Health Data results) assistance.

The follow Figure, analyses the impact on Caregiver's personal living which are directly related with the assistance they provide to the persons which they are responsible. The figure 31 has the analysis on different possible situations that are classified from a lower to a greater level of impact caused of being Caregivers at their personal and also professional living.

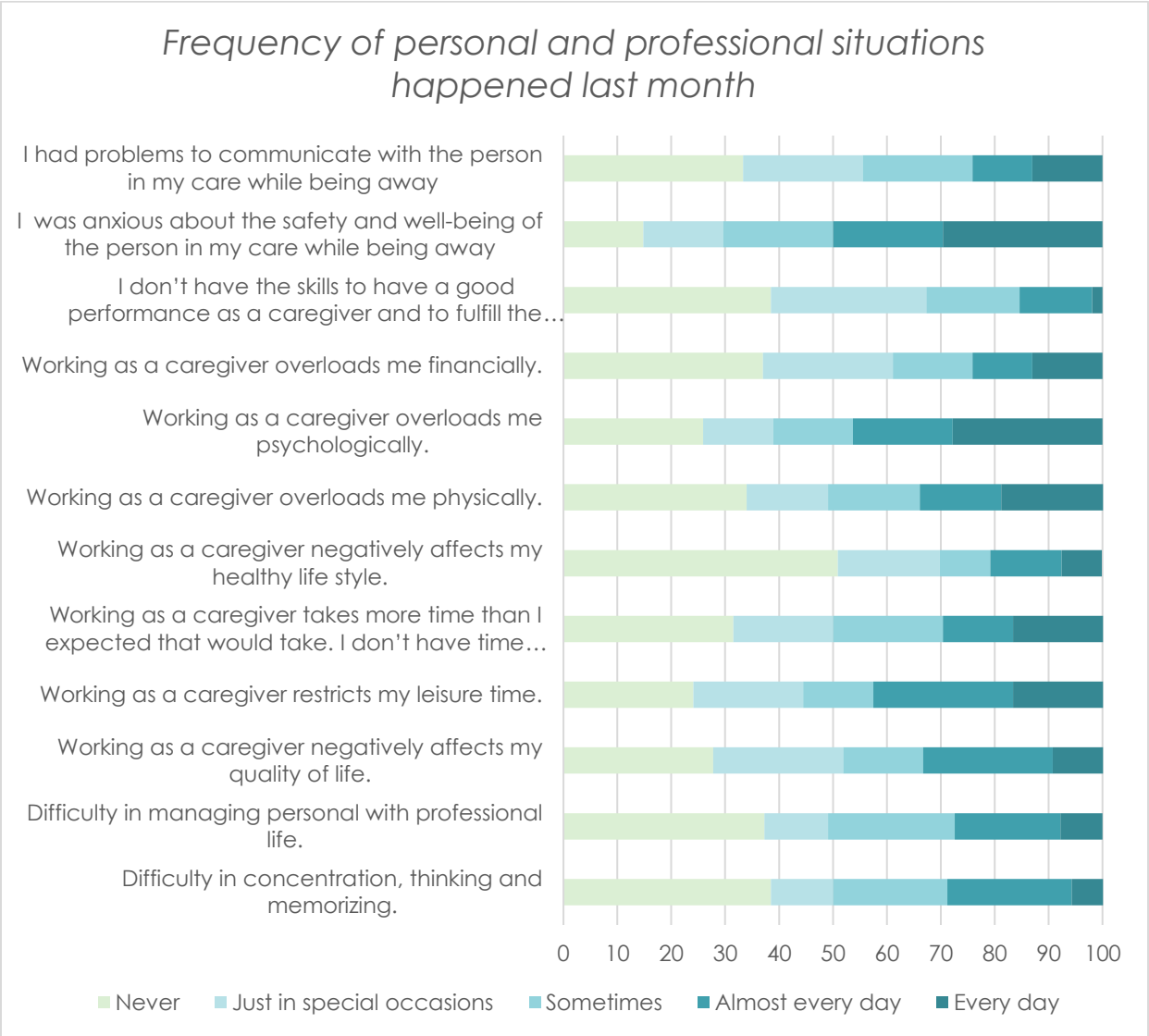


FIGURE 31 - FREQUENCY OF SITUATIONS HAPPENED LAST MONTH

From the above situations, the most critical situations which are affecting negatively the Caregivers are:

- Feeling anxious about the safety and well-being of the person in their care while being away (the majority of the Caregivers have this feeling Every Day);
- Overloading them psychologically (the majority of the Caregivers have this feeling Every Day) (Requirement #16);
- Being restricted to their leisure time (the majority of the Caregivers have this feeling Almost Every Day) (Requirement #16);

To answer those critical points evaluated from this analysis, the last two points are already mentioned on the specific requirements, while for the first is collected a new requirement:

Requirement #18: Enable Informal Caregivers to receive help assistance in case of emergency.

Requirement #19: An online platform to enable the assessment of Health data of the persons in their care at any time.

The Caregivers reveal that working as a caregiver is not negatively affecting their healthy life style and they have the skills to have a good performance as a caregiver and to fulfil the needs of the person in their care. Nevertheless, they reveal some unpleasant situations, but not critical, as:

- Having problems to communicate with the person in their care while being away;
- Being overloaded financially (Requirement #18);
- Being overloaded physically (Requirement #19);
- Wasting more time than expected (ending without time for themselves (Requirements #16 and #19);
- Being affected my quality of life (Requirement #20);
- Managing personal with professional life with difficulty (Requirements #14, #16 and #17);
- Revealing difficulty in concentration, thinking and memorizing.

With the exceptions given on the first and last points, the respective requirements to answer those needs were already identified. For those two points, new requirements are identified below, respectively:

Requirement #20: Ease communication and health data sharing between Caregivers and persons in care.

Requirement #21: Manage the activities of each person in care through a Caretaker Portal.

The Figure 32 represents an analysis on the countries where the surveys were conducted at how Caregivers life can be affected on.

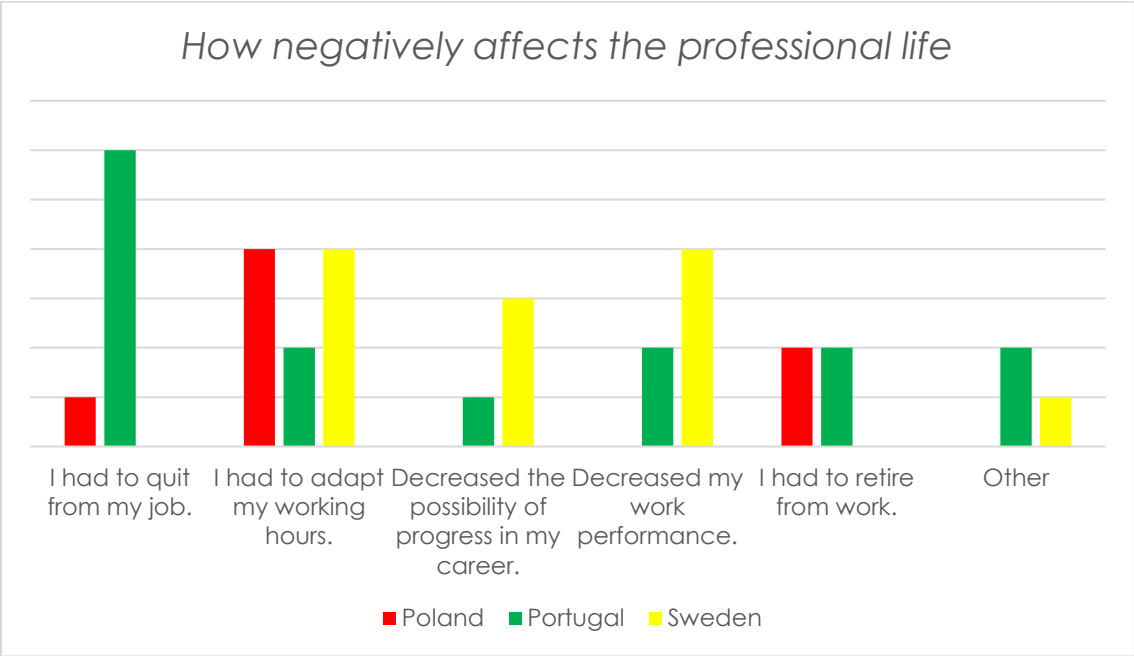



FIGURE 32- HOW CAREGIVERS LIFE CAN GET NEGATIVELY AFFECTED BY COUNTRY

This graphic highlights problems already identified on previous results, giving a more impact in Portugal on a great negative impact which can go to the severe consequences as leaving their job. Poland and Sweden which had no significant results on that first negative consequence, joins Portugal with the need to adapt working hours due to their caregiver activities. Sweden also demonstrates a significant decrease on possibility to progress in their careers and also decrease their professional performance.

This results are important to give an impression to the impact on society due to the seniors' need to have someone that can take care of them, to evaluate permanently their health data and can assist them in case of emergency (Requirement #18).

In order to improve quality life of seniors and also at their informal caregivers, and from a more general perspective, the chronic diseases should prevent, and if not possible to have a continuous evaluation on those (Requirements #2 and #3).

The impact revealed in Poland, Portugal and Sweden demands a solution designed for enhance the Caregivers' efficiency to save time at their personal and professional life (Requirement #16), an online platform to enable the assessment of Health data of the persons in their care by the time it is more comfortable to them or in case of need (Requirement #19) and enable Informal Caregivers to receive help assistance in case of emergency, already mentioned above. If this negative impacts can be significantly



decreased would give a great positive impact on life quality, at an already large number of people affected by this global issue in today's society.

C – Social Demographic Data of the People in your Care

The analyses of the Social Demographic Data of the People in your Care, reveal that most of the persons are Female (nearly two thirds) and the median age of those are 79 years old (a very low percentage of people in their care which are less than 20 years, and the remaining persons are between 60 and 100 years old, having a higher percentage on those which are between 70 and 90 years old.

The level of dependency (*can be classified in 3 levels - 1 - independent / without help, 2 - semi-independent / need some help, 3 - dependent / need help*) and the degree of priority (*can be classified 1 represents the minimum level of priority, 2 is medium priority - some advantage, and 3 represents highest priority - high advantage*) on a different situations that people in care are commonly facing as the Mobility (capacity to move by himself), House Keeping/Management, Meal preparation and cooking, Bills Payment, Goods and services purchase, Medication management, Outside activities (hobbies) participation, Promote a safety environment, Health care support/assistance, Transports utilization and Phone utilization, respectively at Figures 33 and 34.

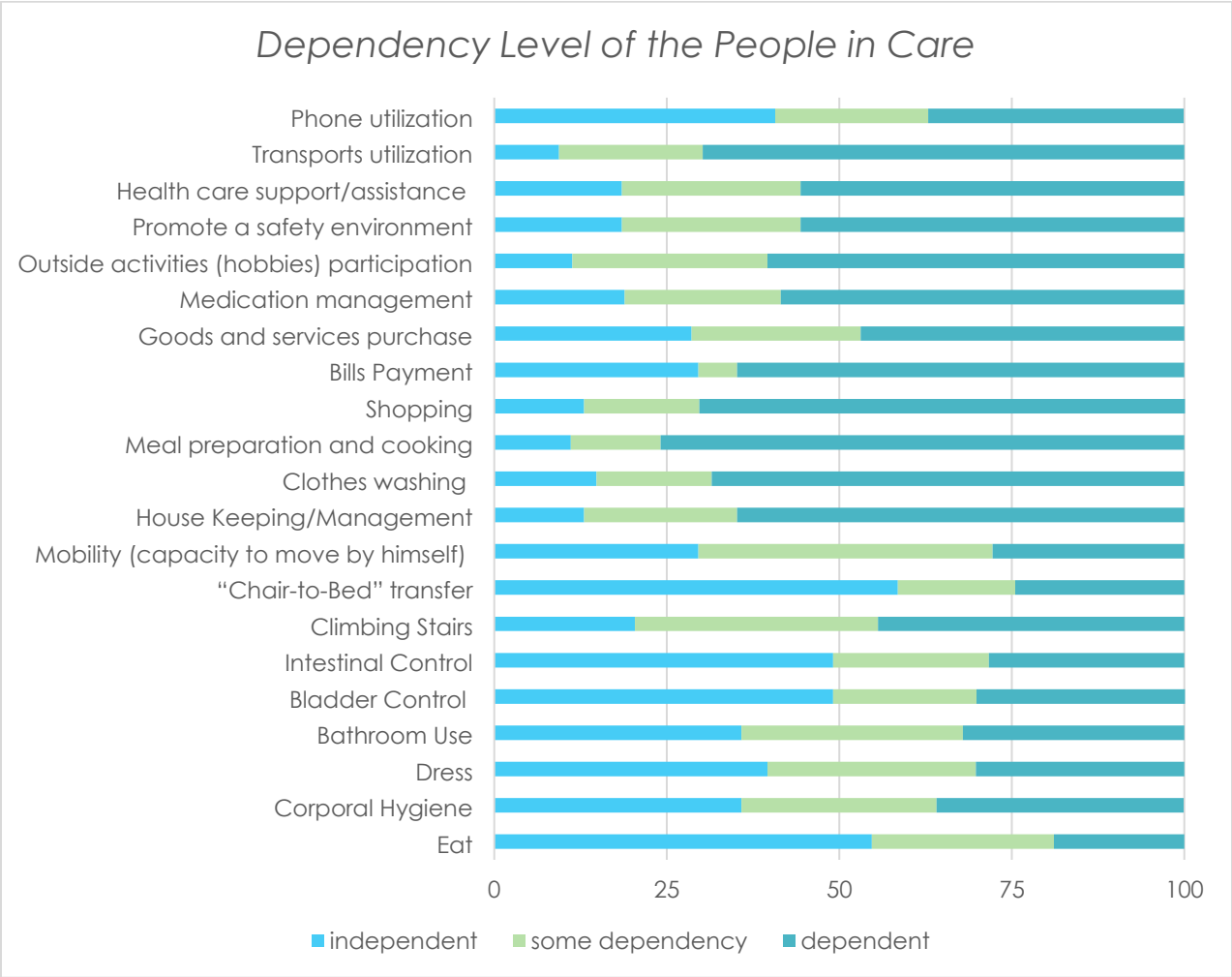


FIGURE 33- DEPENDENCY LEVEL OF PEOPLE IN CARE

From this results, seniors reveal that they are very comfortable on performing some activities alone without any support, such as "Chair-to-Bed" transfer, Intestinal Control, Bladder control, and Eating. Nevertheless, there are other situations, in a higher number, where they reveal total dependency to their carers, and those situations are identified according with their priority degree mentioned on Figure 34.

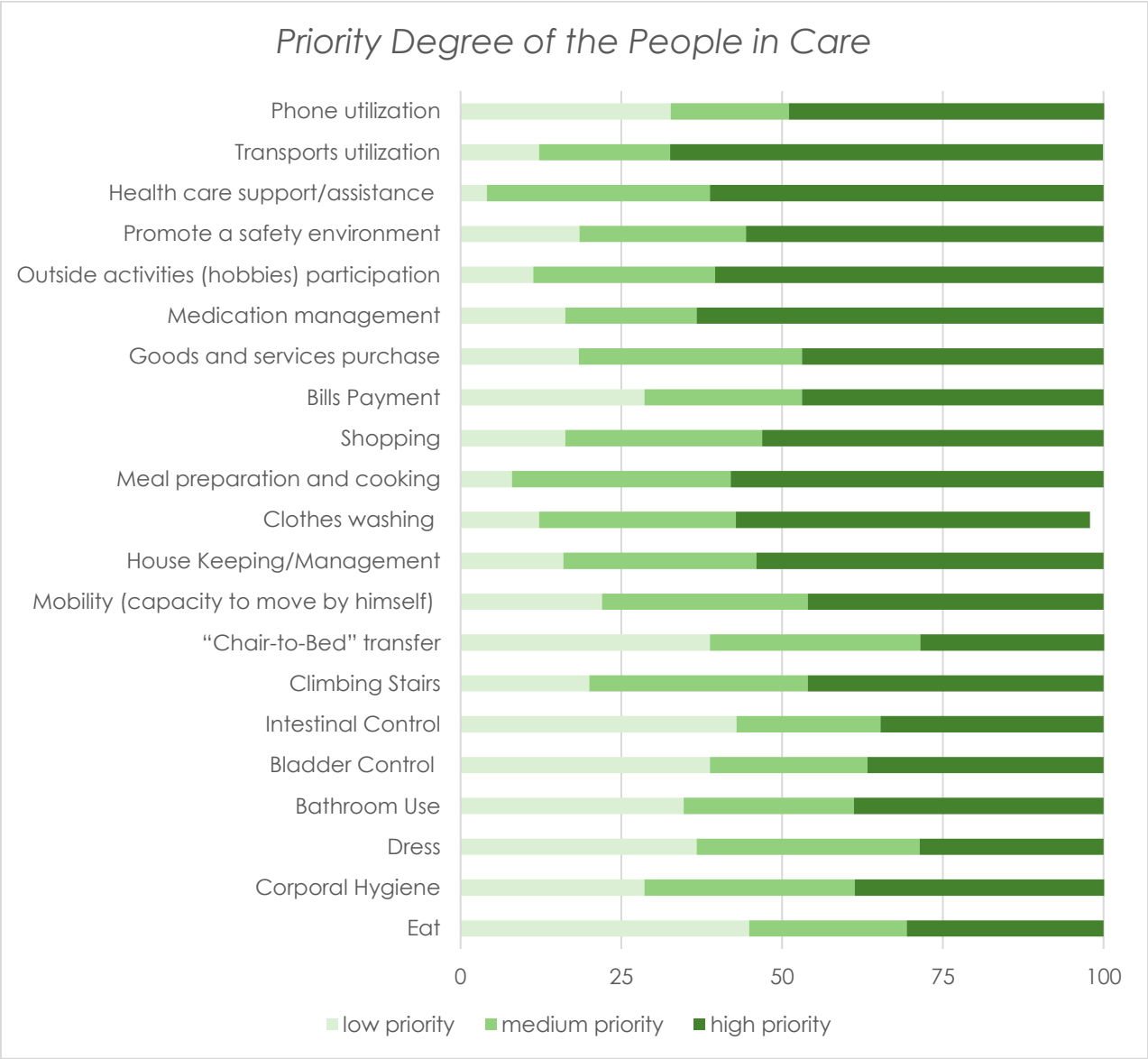


FIGURE 34- PRIORITY LEVEL OF PEOPLE IN CARE

The Table below represents the situations which are identified as those which are more difficult to be performed without any assistance and at the same time that are important for them as being identified with great priority – preference for them to perform them with less constraints.

Very High Priority	High Priority	Medium Priority
Transport Utilization	Meal Preparing and Cooking	Shopping
	Health Care support / assistant	
	Promote a safety environment	
Medication Management	Outside Activities (Hobbies) participation	Bills payment
	Clothes Washing	
	House Keeping / Management	

TABLE 1- ACTIVITIES WITH CONSIDERABLE DEPENDENCY BY PRIORITY

Starting with the activities that are marked with highest priority, the solution can address, even if in a indirectly way, the Transport Utilization by the first two requirements including evaluation and prevention of chronic diseases, becoming more independent of transports by easing the communication with their familiars (requirement #11) and health centers (requirements #9 and #10, respectively); The necessity enforces even more the importance of addressing the Medication Management with a memory support solution for the seniors (requirement #4) and manage the medication activities (requirement #22).

The activities of Meal Preparing and Cooking, Outside Activities (Hobbies) participation, Clothes Washing, House Keeping / Management, Shopping and Bills Payment are activities that become more absent with time and with health conditions weakening, the solution must help to prevent the chronic diseases (requirement #3), to manage their physical activities (requirement #5) and, in a more broad perspective help to integrate seniors and feel more part of society (requirement #14). To complement the user needs already identified, the addition of the measurement of the weight and body balance by a platform will improve the health and well-being control by the individuals themselves and the caregivers on the persons in their care.

Requirement #22: A solution to easily measure the Weight and Body Balance.

The Health Care support / assistant and the promotion of a safety environment complement the other situations with high demand of assistance and priority to be improved. The first one is the combination of the measurements already raised,

management of activities and the communication integrated in a solution, while the second is mostly addressed by the functionality of requesting help in case of emergency by a panic button (requirement #18).

D – Services

This chapter analyses a current evaluation of the services and which ones could be applied or improved with the objective to ease the Caregiver's work with their persons in care and also improve their performance on measuring Health and Well-being data.

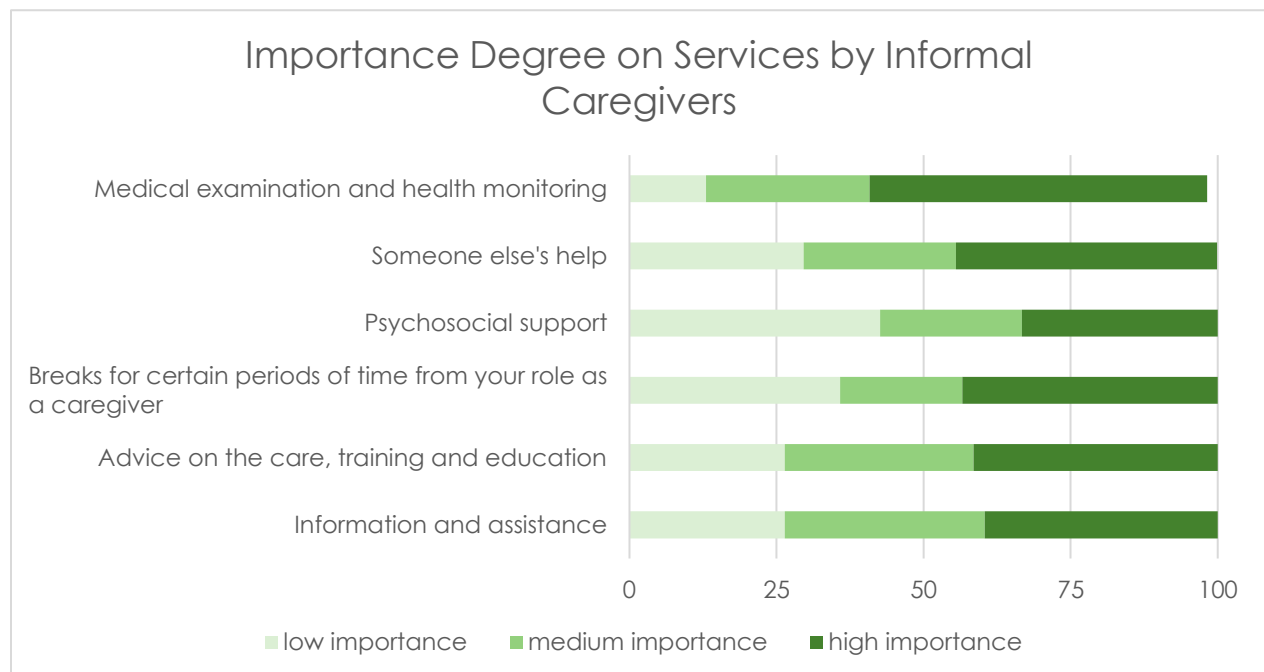


FIGURE 35- IMPORTANCE DEGREE ON SERVICES BY INFORMAL CAREGIVERS

The Informal Caregivers identified the Medical examination and health monitoring as the most important service and useful for the Caregivers.

This results it is easy to conclude that an online platform for Health and Well-being Data will decrease the burden effort on the Caregivers by enabling them a less systematic assistance, allowing breaks for certain periods of time.

The Informal Caregivers also identify the need for receiving support on care, training and education and someone's help which can be combined on the solution with a connection between informal and formal caregivers. On the following survey analysis

(Survey on Formal Caregivers) will be identified their needs, however one need that is already tied to them is their communication.

Requirement #23: A solution to enable communication between Informal and Formal Caregivers, providing sharing of health and well-being knowledge.

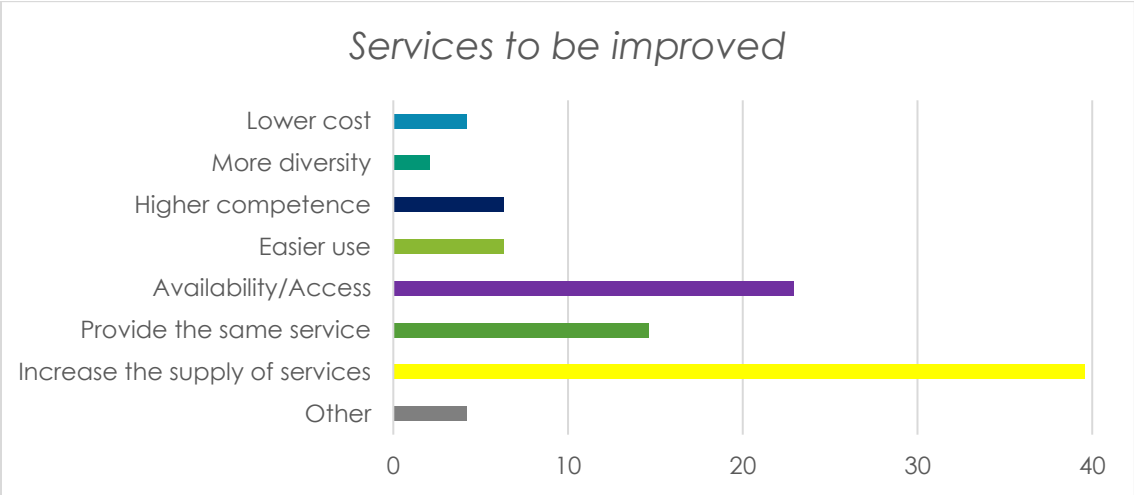



FIGURE 36- SERVICES TO BE IMPROVED ON CAREGIVERS' VISION

The two services identified that have margin to improve and which are important to be addressed are the Availability/Access and the increase on the supply of services. The cooperation between the Formal and Informal Caregivers will respond to the increase demand of care. This cooperation should open new knowledge to the informal caregivers by the formal caregivers (from both private and public sector), facilitating the supply of care assistance. This need reinforces the importance of last collected requirement (requirement #22).

E – New Technologies

The Informal Caregivers reveal that in median they spend 14 hours per week on the Internet identifying the following ends (ordered by preference):

- Email;
- Keep in touch with friends / family;
- News;
- Using bank services.



The number one reason why Informal Caregivers spent more time on internet is related to the necessity and usefulness the email brings into people nowadays. One of preferable ways to communicate between Informal Caregivers and the persons which they have in care would be by email.

Requirement #24: A solution with email integrated to enable and ease communication between the seniors and their caregivers.

The caregivers revealed a high trust on the information gathered from the Internet, having a high level of use of a mobile/smartphone, and a higher use of the portable computer rather than fixed computer. On a more recent technologies, the informal caregivers revealed that only a third of them own a tablet, nevertheless they have a high level of use, while only one in ten own a smartwatch. When questioned if the Informal Caregivers use their devices when they are working as a caregiver, just a slightly more than half (52%) reveal that they do.

The Informal Caregivers would not need an adaption to the smartphone, computers and other technologies since they are regular users of those.

The type of information the Informal Caregivers prefer to have access through their mobiles are represented on the Figure below.



Type of information the Informal Caregivers prefer to have access through their devices

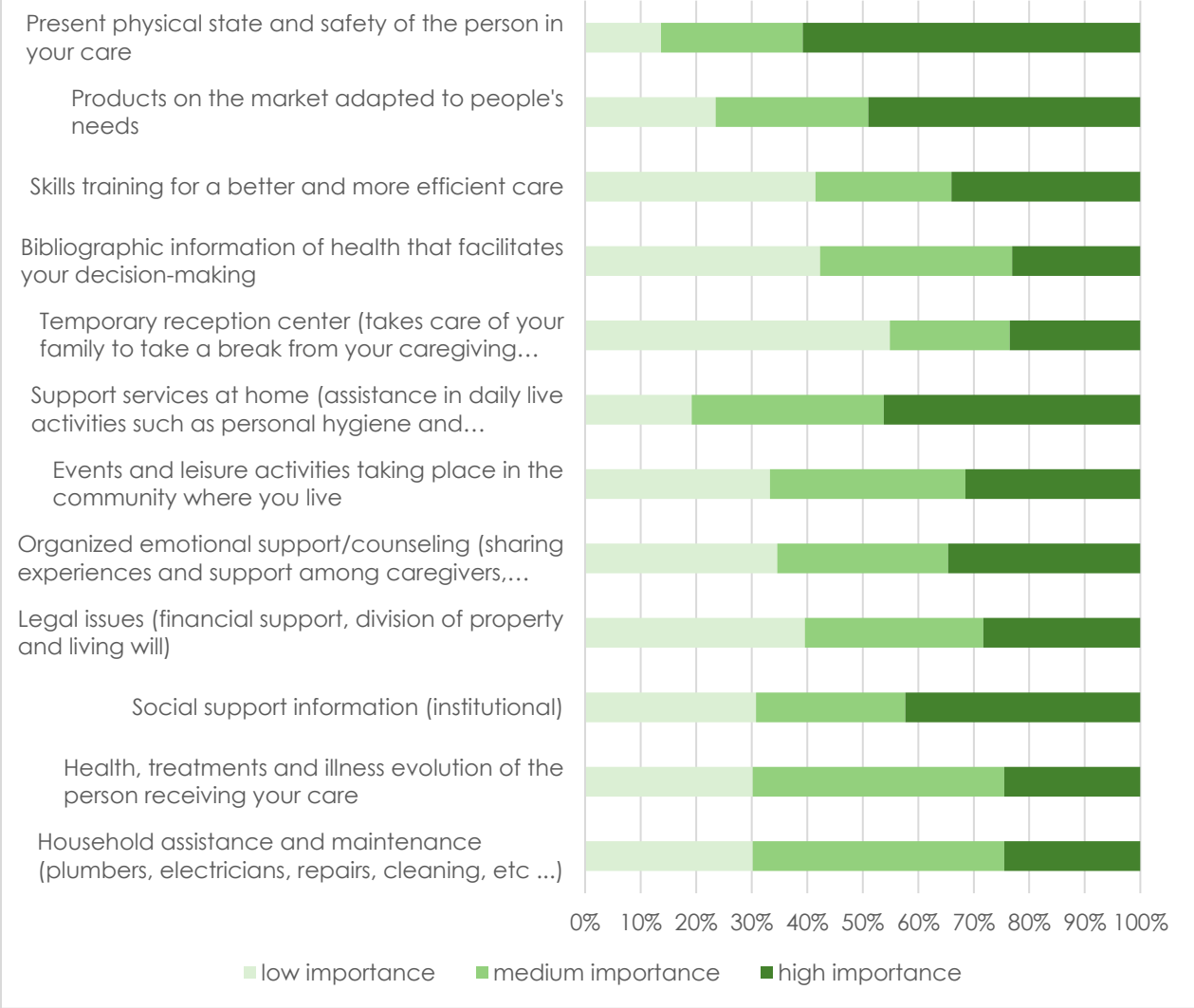


FIGURE 37- TYPE OF INFORMATION THE INFORMAL CAREGIVERS PREFER TO HAVE ACCESS THROUGH THEIR DEVICES

From this analysis, there are four types of information which stands as preferable by the Informal Caregivers to be accessible from their devices are a present physical state and safety of the person in your care, Products on the market adapted to people's needs, Support Services at home and Social Support information.

The Informal Caregivers identified the importance of having a support service available on their devices which could verify the physical state and look for the safety of the person

in their care. The availability of a solution with social support information would be seen as a great advantage for them, and will also fight the great demand for care.

Requirement #25: The health data measures should be readable on the most common devices, including smartphone, portable/fixed computer and tablet.

To promote the autonomy/independence of the persons receiving care and promote their quality of life (at home, work, or leisure time) environments are created using different systems and developing smart environments. The Figure 38 analyses those on daily life activities support, health and life care, life leisure promotion and ageing at work.

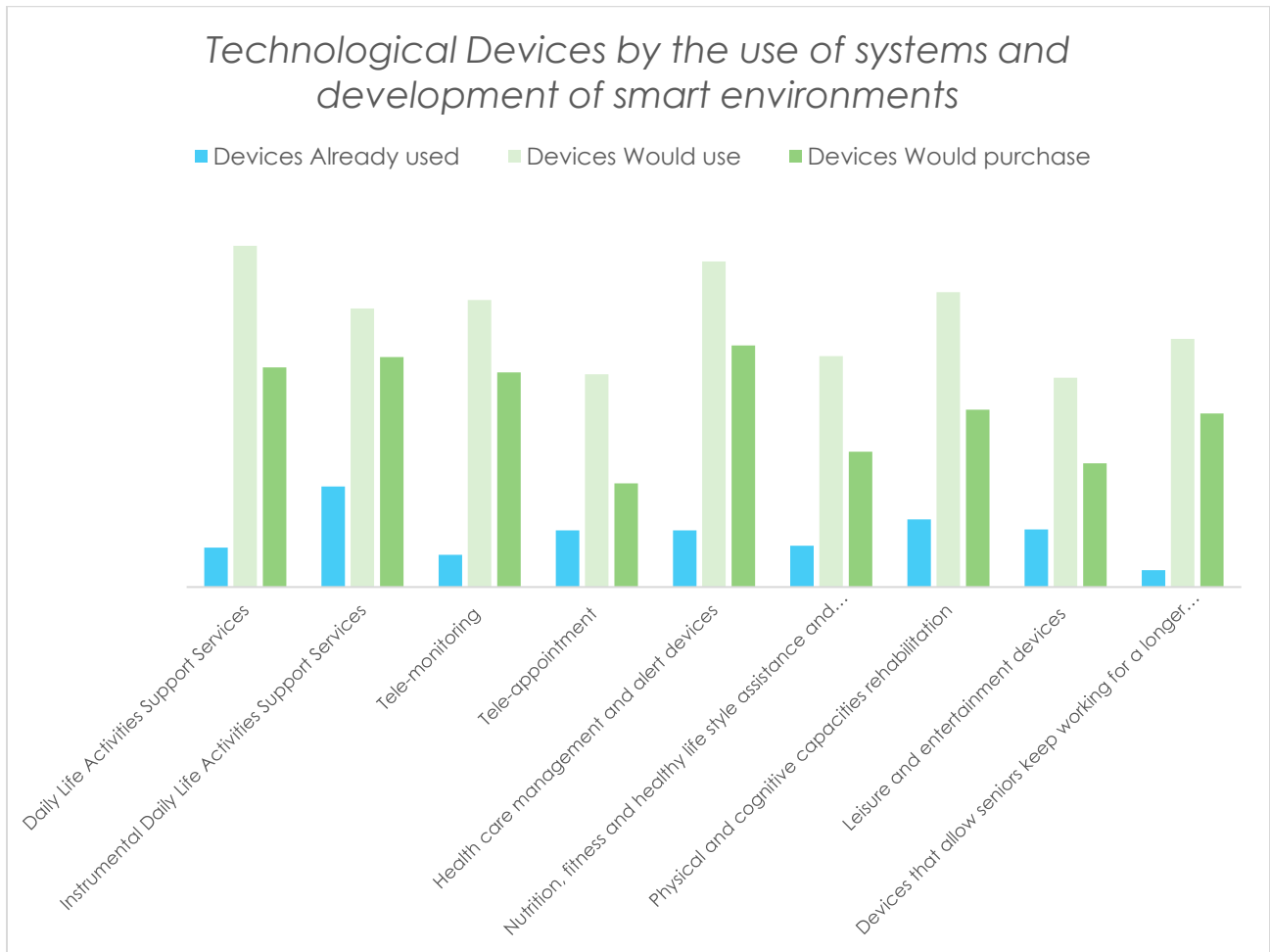



FIGURE 38- TECHNOLOGICAL DEVICES BY THE USE OF SYSTEMS AND DEVELOPMENT OF SMART DEVICES

The Figure 38 demonstrates that the Informal Caregivers are not currently using technological devices when they are providing assistance to the persons in their care.



With an exception on the low percentage of Informal Caregivers that use Instrumental Daily Life Activities support services and Physical and cognitive capacities rehabilitation, the remaining technologies are generally not being used.

The Informal Caregivers identified three 5 technologies on which they are feel that need or that would bring an important support at their work, naming in order of preference:

1. Daily Life Activities Support Services;
2. Health-care management and alert devices;
3. Physical and cognitive capacities rehabilitation;
4. Tele-monitoring;
5. Instrumental Daily Life Activities Support Services;

With the exception on third technological point, all the remaining four are identified as an improvement on which they would be willing to purchase and acquire those services.

The solution will address the main technological needs, as the requirements collected in the document addresses these questions, with the exception of the last need – Instrumental Daily Life Activities Support Services. The activities such as house cleaning, supply and payment of goods and services would be a great benefit and which they would be interested to acquire.

Requirement #26: Inclusion of services to support Instrumental Daily Life Activities.

The Figure 38's results also demonstrate an interesting input for the Business Model, by revealing the priorities of services on which these Caregivers have more interest to have as a support.

To complete the analysis regarding the preferences of the most important categories from the Informal Caregivers' perspective, the following Figure identifies the Informal Caregivers' preference between the categories Health and Life Care, Daily Life Activities Support, Ageing at work and Life Leisure Promotion.

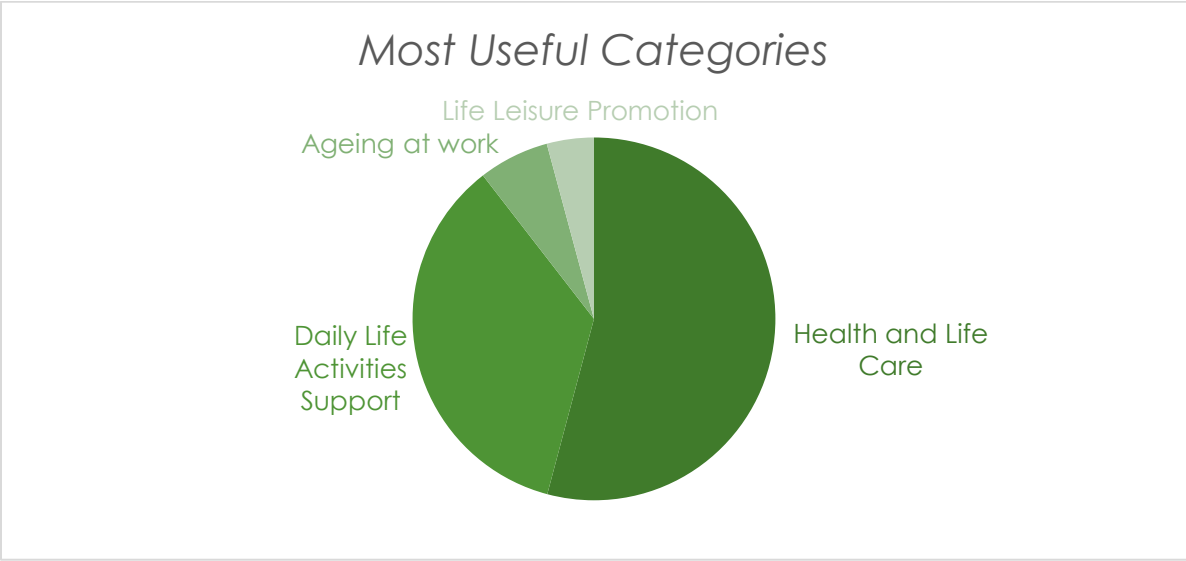


FIGURE 39- MOST USEFUL INFORMAL CAREGIVERS' CATEGORIES

The following Figure represents the results on the reasonable fee for the solution on the Informal Caregiver's perspective. It will be made a comparison with the senior's result on this matter to evaluate the major differences between Senior's and Informal Caregiver's perspectives.

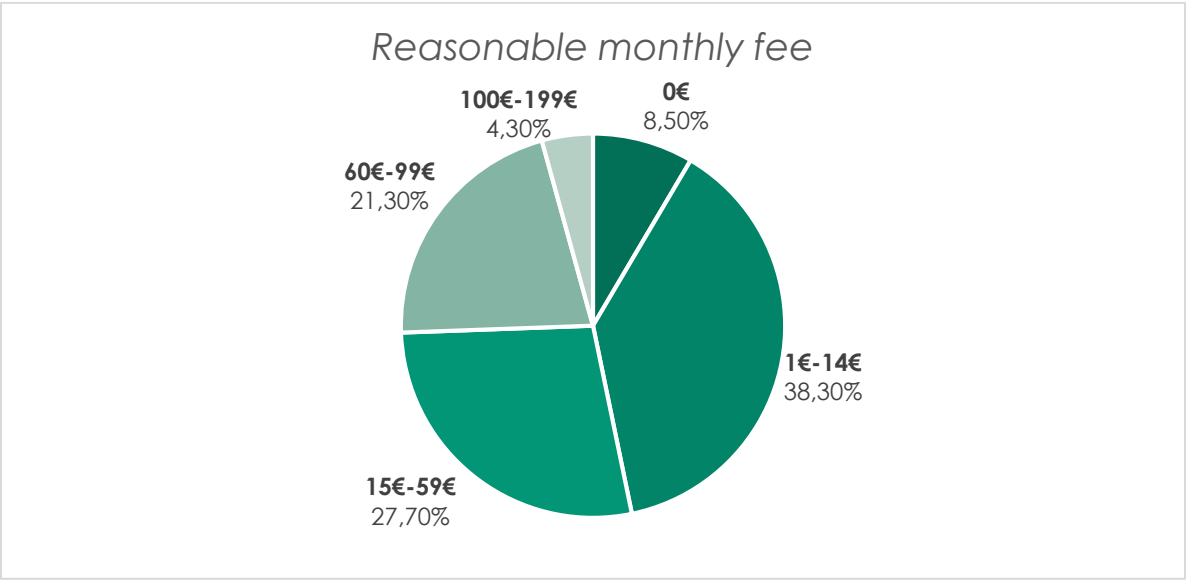


FIGURE 40- REASONABLE MONTHLY FEE ON INFORMAL CAREGIVERS' PERSPECTIVE

The Informal Caregivers are willing to spend more compared to the evaluation made by the seniors, represented on the Figure 21. While nearly 80% of the seniors consider a

maximum price of 14 Euros for the solution, 87% of the Caregivers consider reasonable a price below 100 Euros. The majority of the caregivers consider to pay under 15 Euros, while only 8,5% are consider that they would only use it for free, against 19% of the seniors.

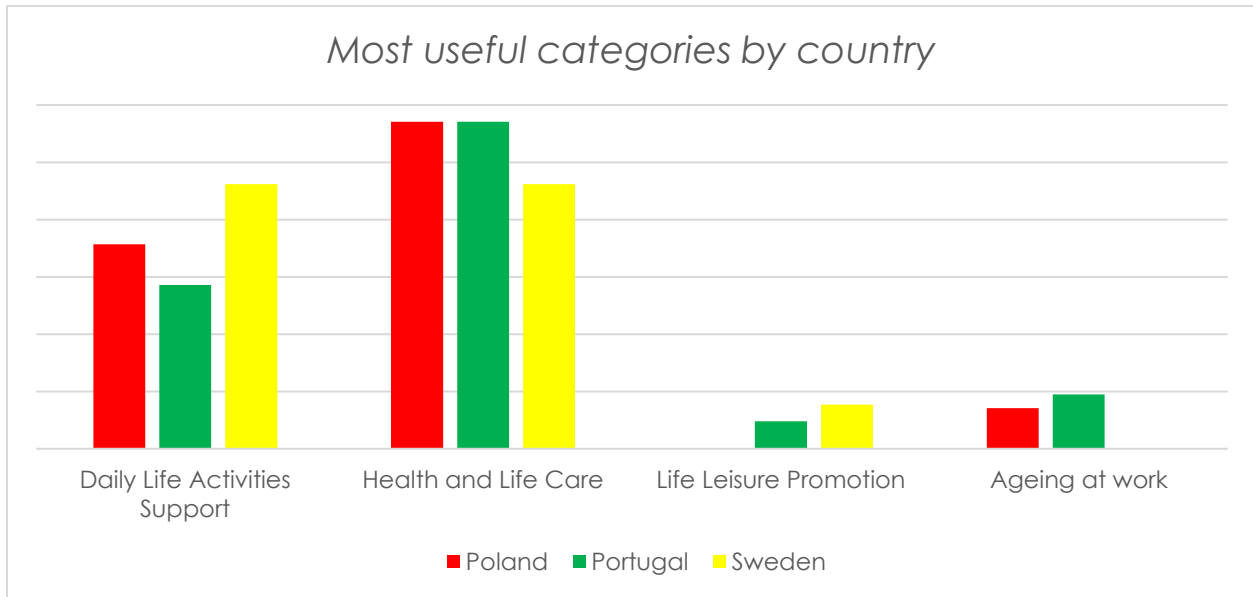


FIGURE 41- MOST USEFUL CATEGORIES BY COUNTRY

The categories from the three countries identified the Health and Life care the most useful and preferable category. In fact, Sweden has two major preferences, the other is the Daily Life Activities Support, where is the second preference of Portugal and Poland. Other significant notes are that in Poland the Informal Caregiver's have none interest in Life Leisure Promotion and in Sweden they have none in Ageing at work – at both, the Informal Caregivers on the remaining countries represent less than 10%.

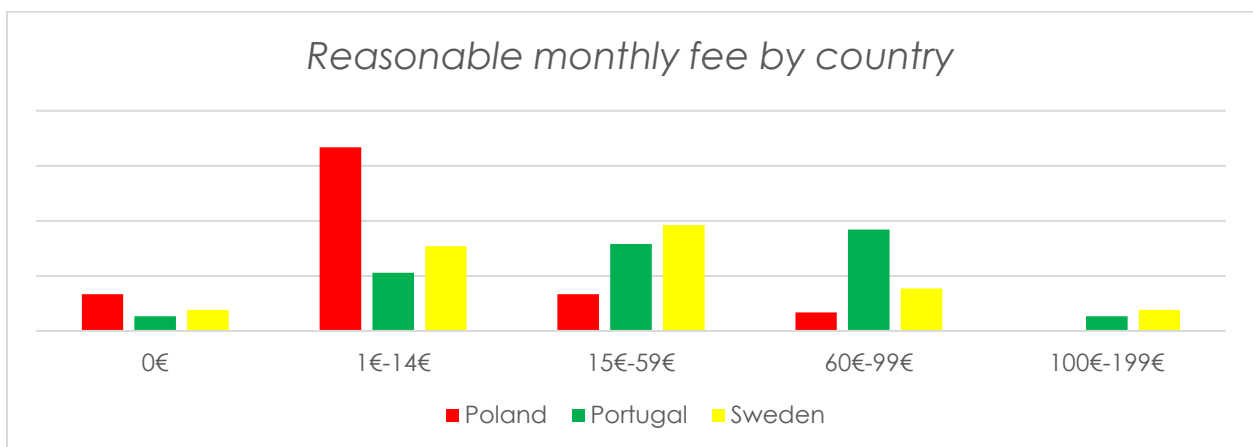


FIGURE 42- INFORMAL CAREGIVER'S REASONABLE MONTHLY FEE BY COUNTRY

The Figure 42 analyses the reasonable monthly fee by country, highlighting the following notes:

- Poland – A high percentage of the Informal Caregivers set a maximum of 14 Euros of monthly fee, while they do not consider values higher than 100 Euros.
- Portugal – The majority of the Informal Caregivers in Portugal consider a maximum of 100 Euros, but preferable less than 60 Euros (58%).
- Sweden – The majority of the Informal Caregivers in Sweden consider a maximum of 60 Euros, with the interesting note that the number of Informal Caregivers in Sweden that consider a price between 60 and 90€ are two times more of the ones who would only use it for free.

The Figure 43 underneath identifies the Informal Caregivers' perception on the older people. The figure reveals that due to older people's age they are lightly uncomfortable on using assistive technological devices with older people, the older people interacts poorly with technological devices, are not concerned that they will not able to perform well with assistive technological devices with older people and they are convinced that society in general sees the older people are less able to use assistive technological.

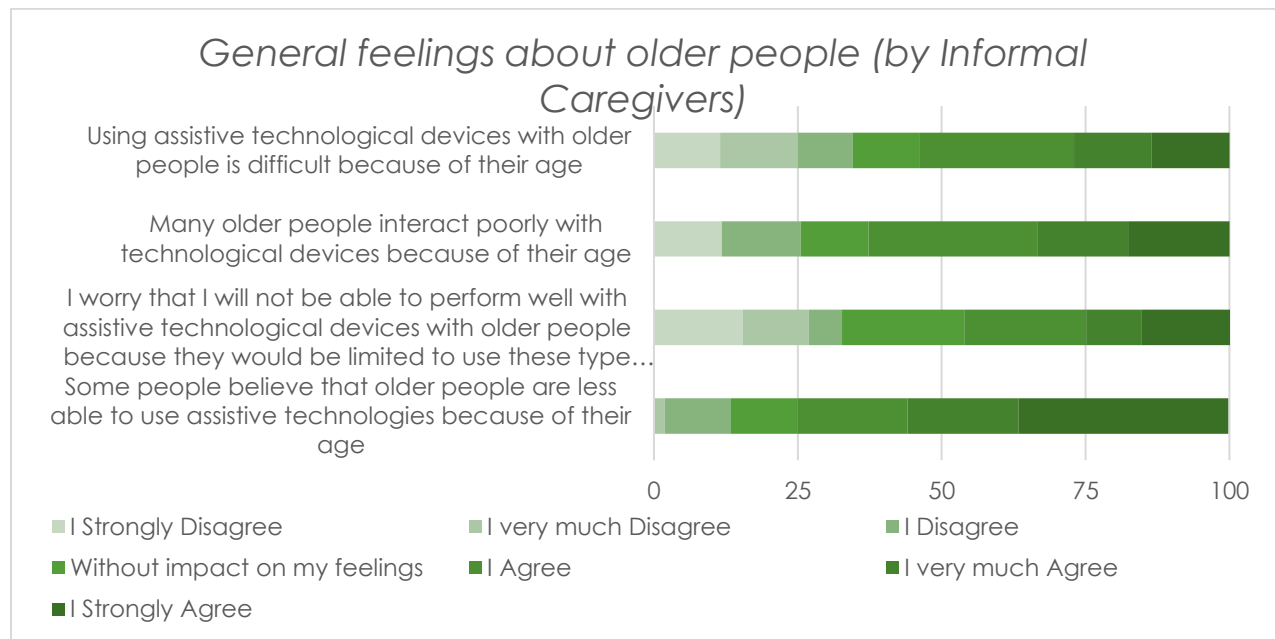


FIGURE 43- INFORMAL CAREGIVERS' GENERAL FEELINGS ABOUT OLDER PEOPLE

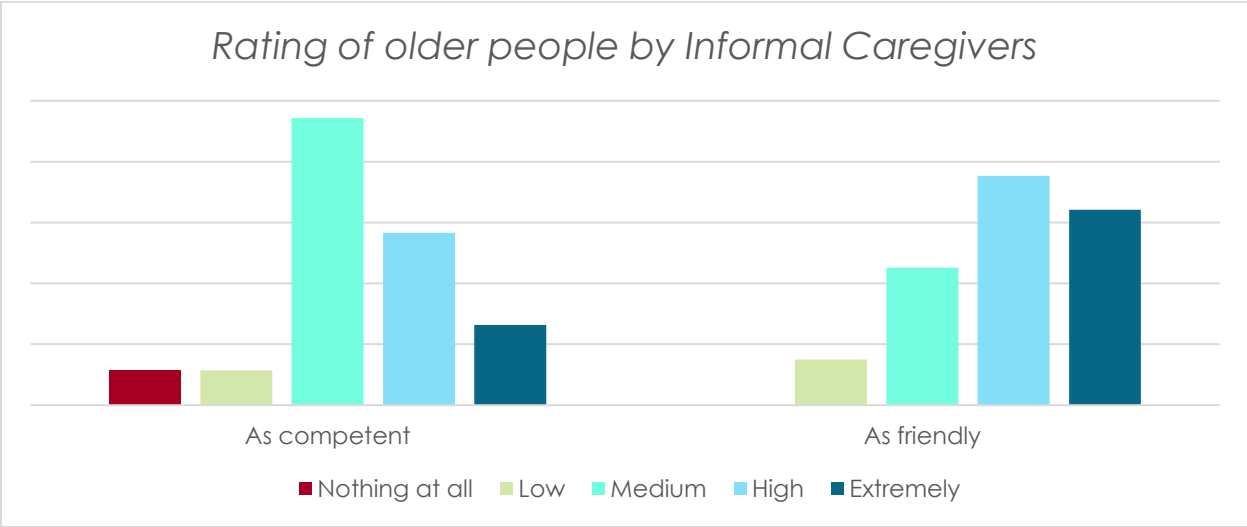


FIGURE 44- RATING OF OLDER PEOPLE BY INFORMAL CAREGIVERS

The figure above represents the evaluation of the Informal Caregivers in older people's competency and friendliness. The results are significantly more negative than the senior's results on both aspects, especially on the competency, where the majority of the Informal Caregivers consider that older people have a reasonable level of competency, with even some individuals consider that they can be totally or at some level incompetent.

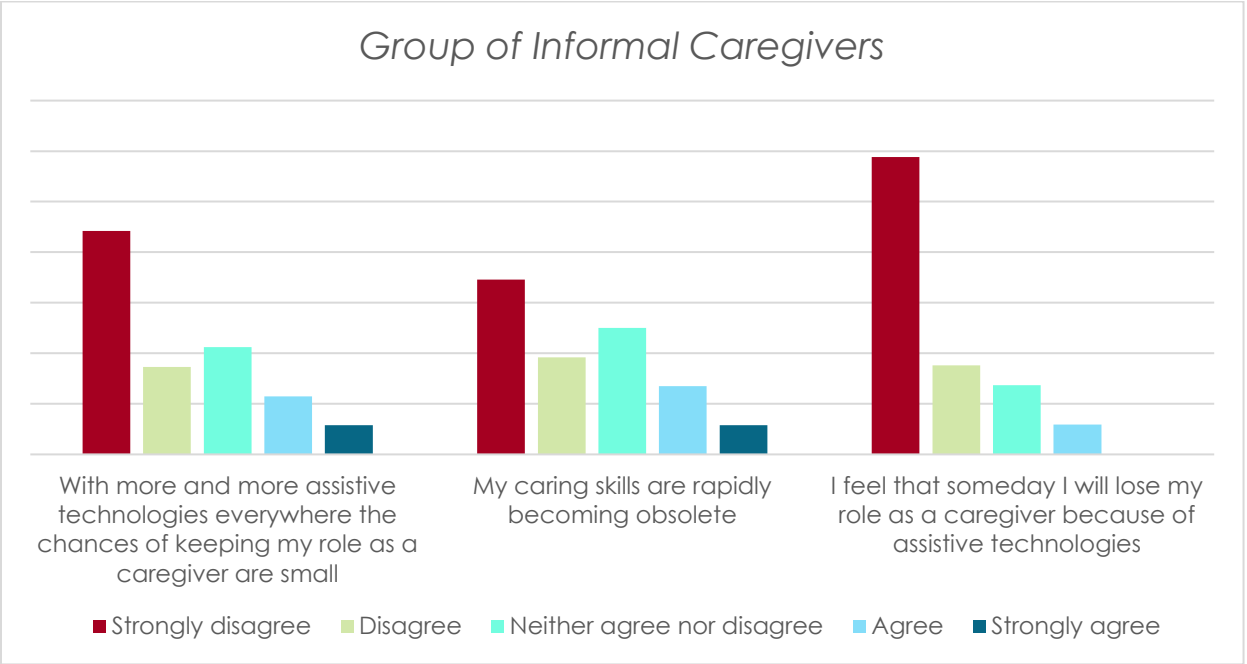



FIGURE 45- GROUP OF INFORMAL CAREGIVERS



In summary, the Informal Caregivers do not feel that the opportunity of keeping their role is decreasing with the advantage on assistive technologies, their caring skills are still updated and they are convinced that they will not lose their role as a caregiver because of assistive technologies.

4.3.3 Formal Caregivers' Survey Results

The surveys of Formal Caregivers are structure with the following four sections:

- A. Socio Demographic
- B. Technology
- C. People in Care
- D. General Feelings

A. Socio Demographic

Sixty Four Formal Caregivers have participated on the survey in Poland, Portugal and Sweden, which 90% of those are females and a median of 48 years old.

Most common organizations where the Formal Caregivers perform their work

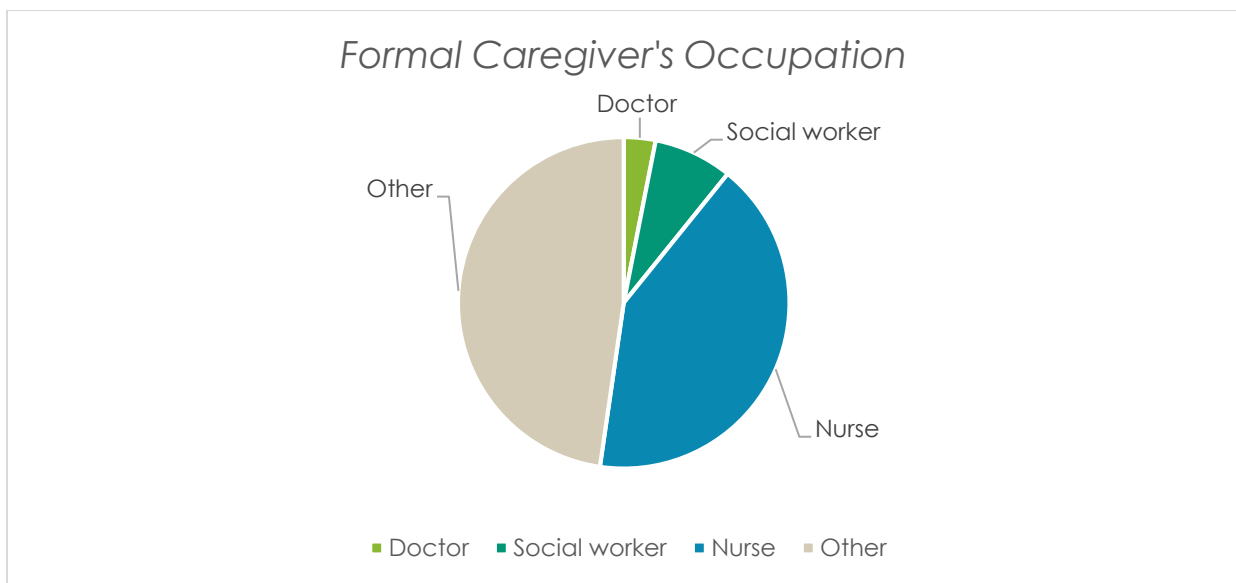


FIGURE 46- FORMAL CAREGIVERS' OCCUPATION AT RESPECTIVE ORGANIZATIONS

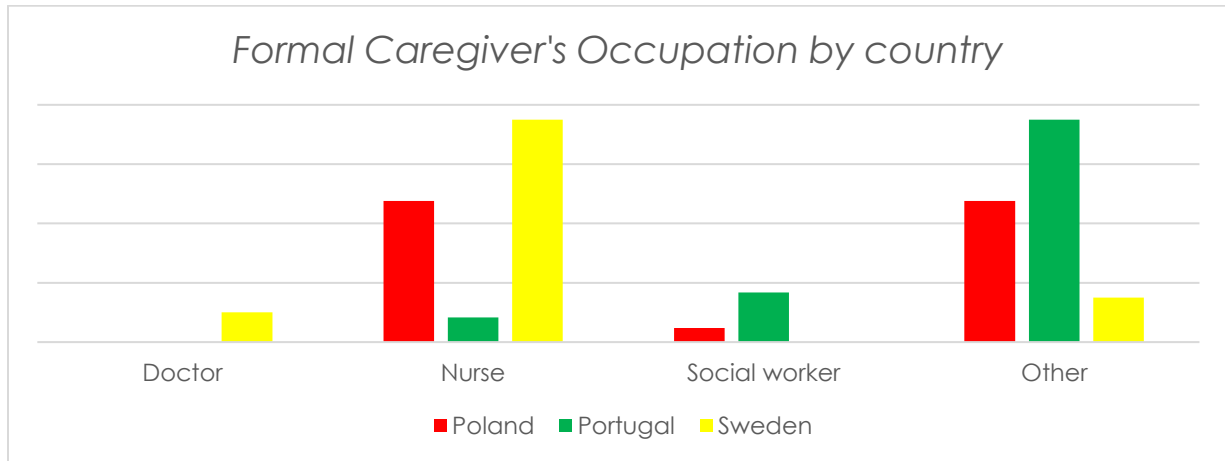


FIGURE 47- FORMAL CAREGIVER'S OCCUPATION BY COUNTRY

The Formal Caregivers' occupation are identified in three different categories, namely Doctor Nurse and Social worker, on the Figure 47. Doctors and Social workers are in low number, the first only present in Sweden and the last in Portugal and Poland. Poland and Sweden are represented with a considerable number of Nurses, representing the large majority of occupation of Formal Caregivers in Sweden. From a general perspective, an additional note for the median number of numbers the Formal Caregivers have exercised their profession as a doctor or nurse is 11.

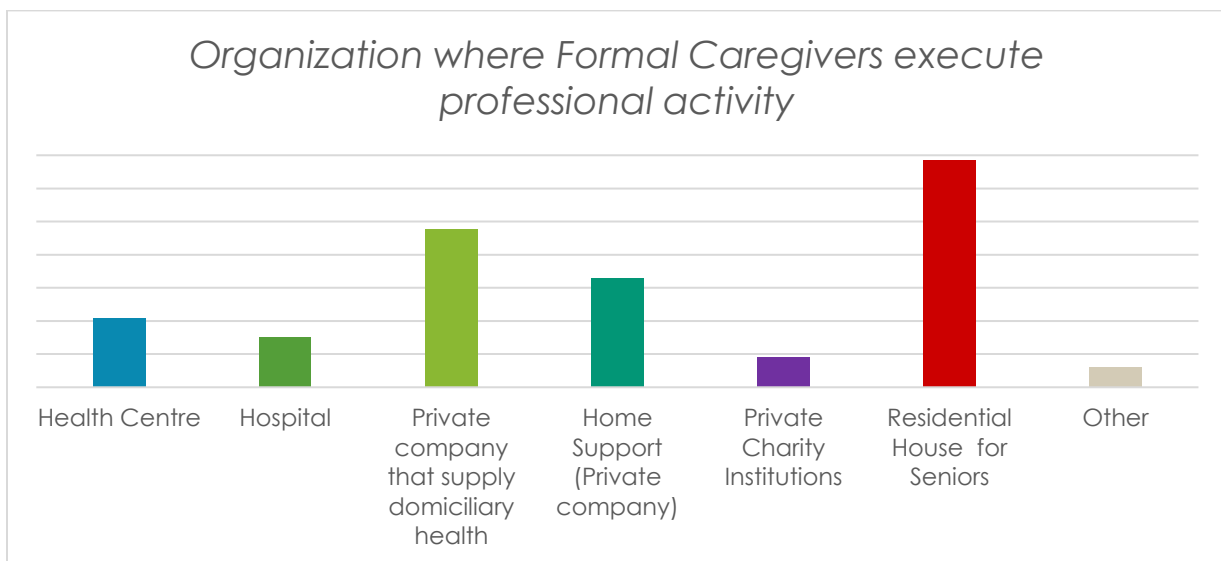


FIGURE 48- ORGANIZATIONS WHERE FORMAL CAREGIVERS EXECUTE PROFESSIONAL ACTIVITY

Above, the Figure 48 illustrates the organizations where Formal Caregivers execute professional activity, identifying that Residential House for seniors as the organization more common between Formal Caregivers. Private companies that supply domiciliary

health and Home support companies are the following organizations where Formal Caregivers are in large percentage.

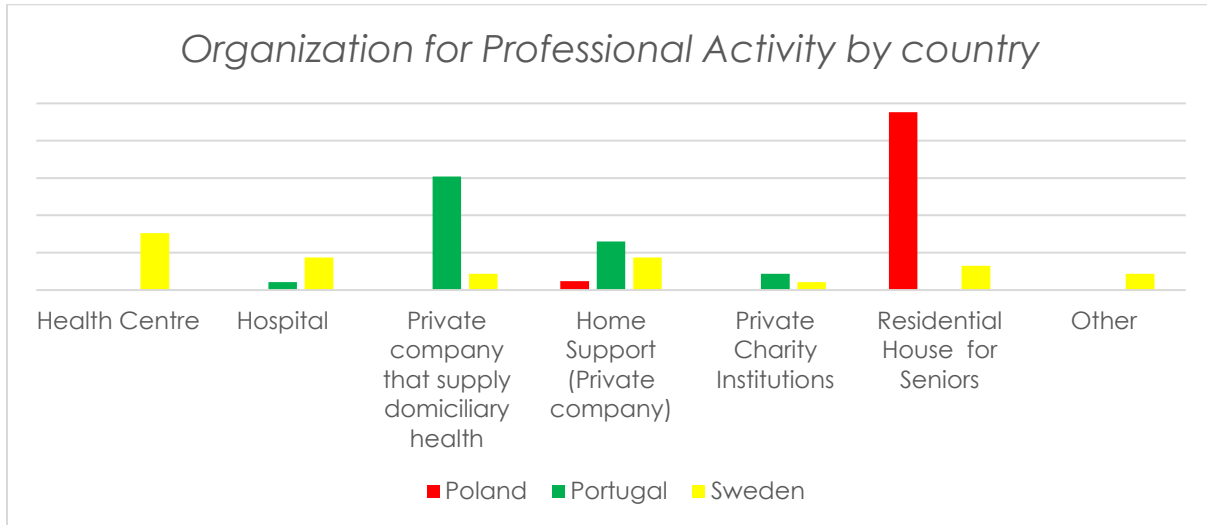


FIGURE 49- ORGANIZATIONS WHERE FORMAL CAREGIVERS EXECUTE PROFESSIONAL ACTIVITY BY COUNTRY

The figure 49 represents the organization for professional activity by country of Formal Caregivers. The most relevant results from this figure, is that Residential house for seniors is the most common and almost unique organization in Poland (the remain work at private companies for Home Support), Private companies that supply domiciliary health are the most common in Portugal, in Sweden are dispersed by all organization categories.

B. Technology

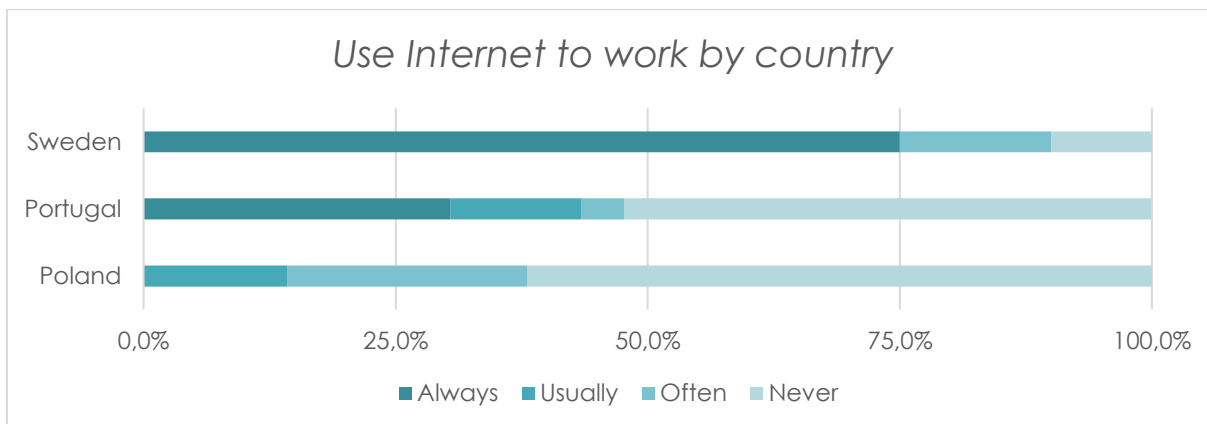


FIGURE 50- FORMAL CAREGIVER'S USE OF INTERNET TO WORK BY COUNTRY

The Formal Caregiver's patients talk very rarely about information that they saw on the internet or got to know via tablet, computer, smartphone, inducing that the patients. A gap is created between the patients and the Formal Caregivers related with the knowledge and use of technology, particularly in Sweden where 75% of the carers are permanently using Internet to work. For a more precisely analysis on the use of Internet on the work by the Formal Caregivers, please view the previous Figure 50.

The next Figure 51 analyses the Information and Communication technologies used by the Formal Caregivers, and there is not one relevant technologies that stands from all the others.

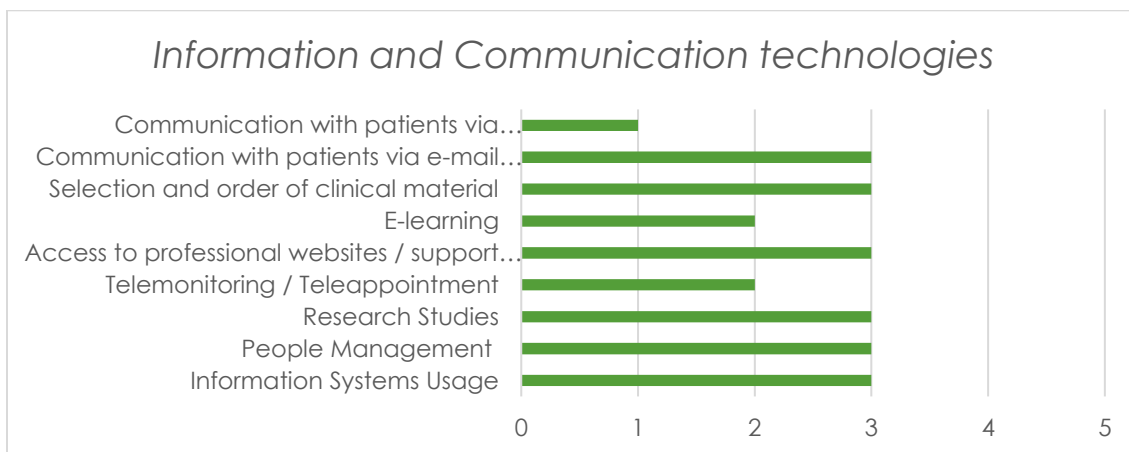


FIGURE 51 - LEVEL OF INFORMATION AND COMMUNICATION TECHNOLOGIES USED BY FORMAL CAREGIVERS

Nevertheless, the level of communication with patients via professional platforms is almost inexistent, and is for sure one of the issues which OLA will be focusing to improve (Requirements #20 and #23). The OLA solution will enable a more active and easy communication, addressing also other information and communication technologies which are relevant on the daily work of Formal Caregivers, the integration of email on the platform (Requirement #24), Telemonitoring/ Teleappointment (respectively, Requirements #2 and #21) and Information Systems Usage (Requirements #12 and #14).

The topics which have not been addressed at this moment in the document are Selection and order of Clinical Material, e-learning, access to professional websites / support groups, Research Studies and People Management.

- Selection and order of Clinical Material could be improved with a Portal to contact directly suppliers for the necessary clinical material.

Requirement #27: Integrate an online shopping of Clinical Material for the Organizations.

- E-learning platform to search and share important knowledge about Health and Well-being related information.

Requirement #28: E-Learning Platform with relevant information to be shared between Formal Caregivers, including e-books, websites and forum groups.

- Access to professional websites / support groups and Research Studies functionalities could be integrated together with the Platform mentioned above.
- People Management can be improved by a Caregivers Portal, managing the information of his patients, including general information, historical diseases, address and phone contact, informal caregiver contact, other specific notes about the patient.

Requirement #29: A Caregivers Portal to manage the patients' information.

On the following figure, Figure 52, it will analysed from the Formal Caregiver's perception, which are the most helpful systems by participated country.

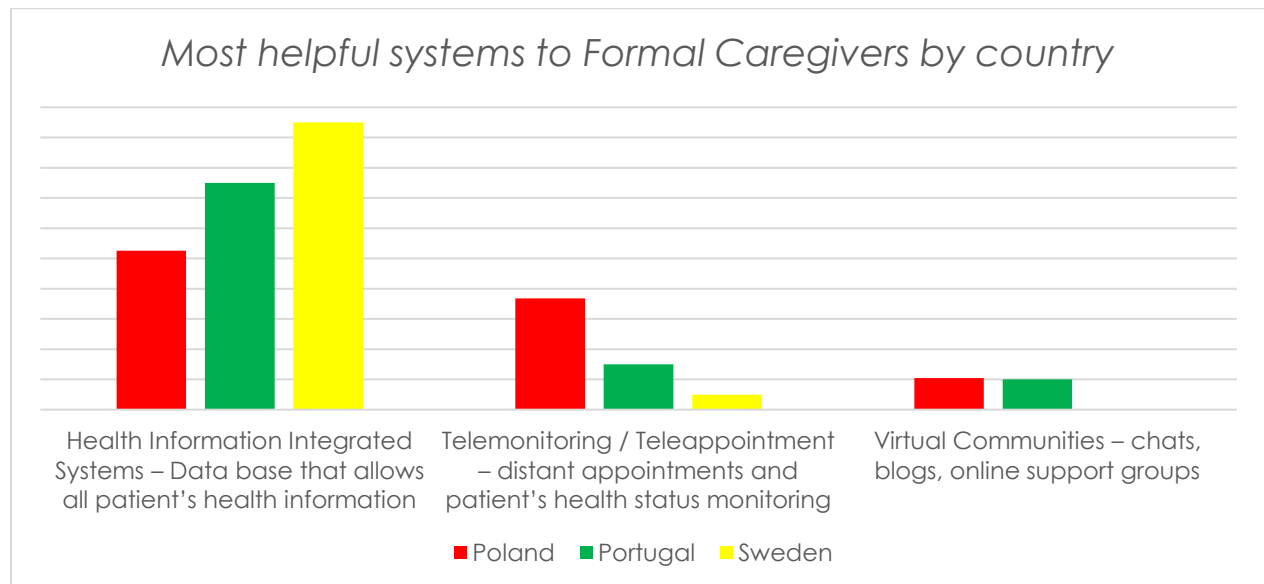


FIGURE 52- MOST HELPFUL SYSTEMS TO FORMAL CAREGIVERS BY COUNTRY

The three participated countries pointed the Health Information Integrated Systems as the most helpful systems, being the choice of the majority of the Formal Caregivers in

each country. The Telemonitoring / Teleappointment is also mentioned as a helpful system in Poland. From this Figure's results it is important to highlight the importance of Formal Caregivers on the Health System – stating as the major priority on a solution to analyse and evaluate the patients' health information, a medium priority on the Telemonitoring / Teleappointment and the lowest priority in a the Virtual Communities for Health Care (low priority on the Requirement #28).

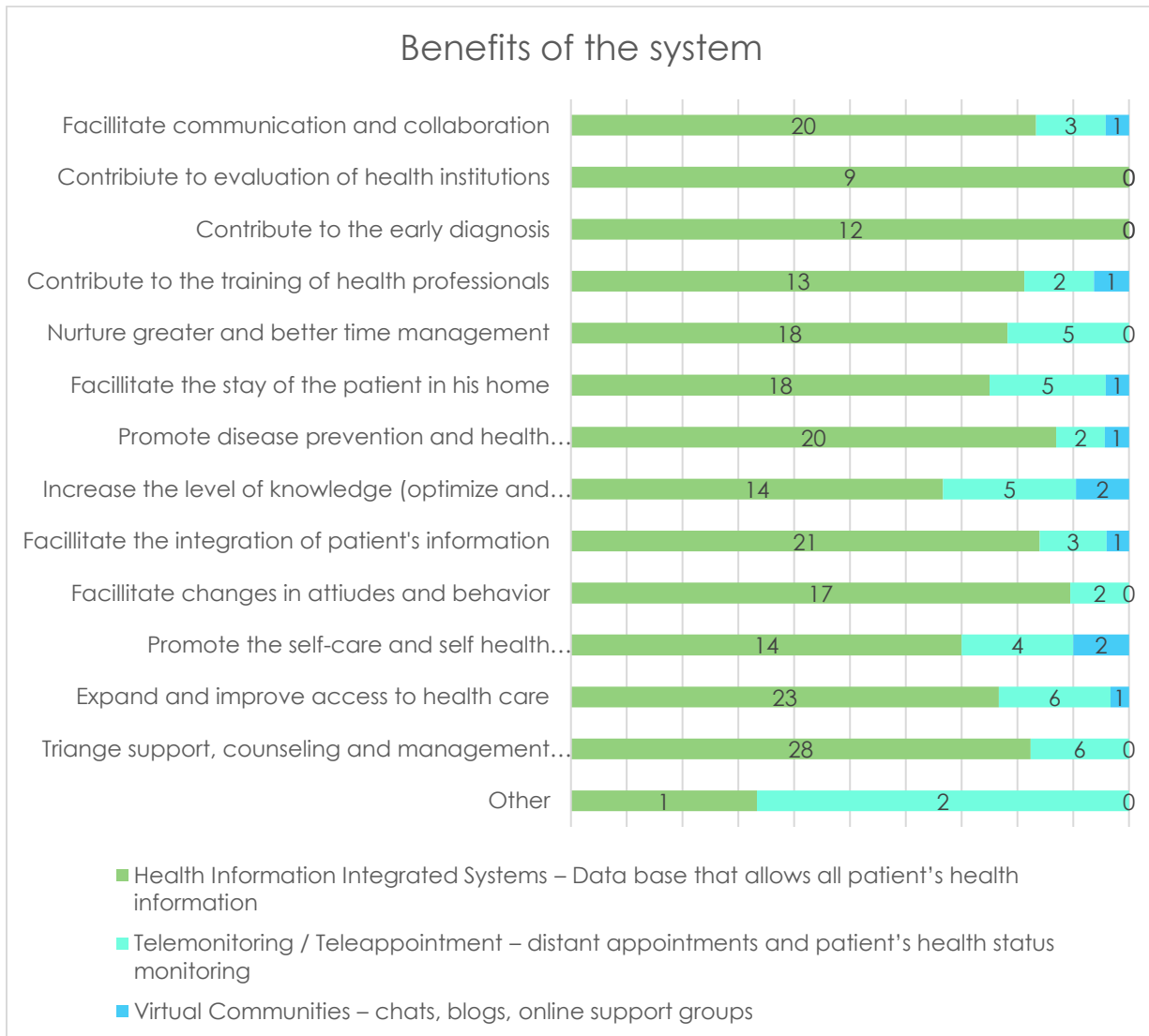


FIGURE 53- BENEFITS OF THE SYSTEM

The major benefit of the system identified by the Formal Caregivers is the Triangle support, counselling and management of patients. From the Caregivers' perspective, the patients will be the most benefited persons from the system, but it will be reflected at all society as it will be linked to agile the work of Formal Caregivers and will improve the quality of

life of Informal Caregivers, as in implicit on the other highly ranked benefits from the Figure – Nurture greater and better time management, Facilitate the stay of the patient in his home, Facilitate of the integration of patient's information and Expand and improve access to health care.

Following the Benefits of the system previously chosen, the Figure 54 illustrates the barriers of the system identified by the Formal Caregivers.

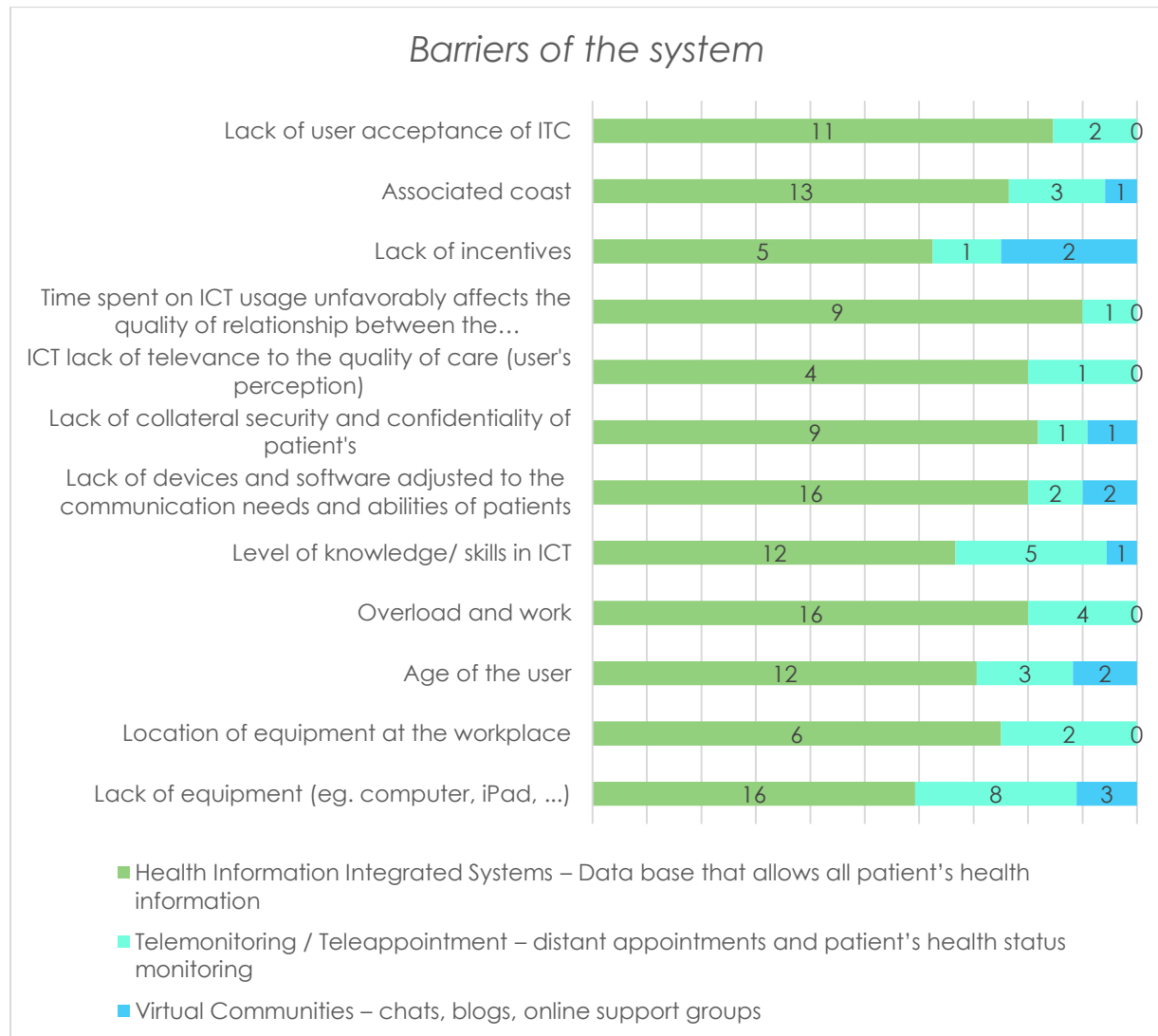



FIGURE 54- BARRIERS OF THE SYSTEM

The Lack of equipment is the most conjoint barrier identified among caregivers – it is a fact that in order to be able to use OLA, their users are confined to buy computer or tablets. The solution will not be heavy and largely dependent on graphical interface so it can run at devices with accessible prices.



Requirement #30: Considering the dependency on the technology equipment, the solution should be available for devices with low requirements.

Two other major barriers identified by the Formal Caregivers are the Lack of devices and software adjusted to the communication needs and abilities of the patients and the Overload and work.

Due to the special communication needs and abilities of the patients, the solution offers multiple ways to interact with the users – important to include touch and/or speech technology (Requirement #11). Considering that is issue is a major barrier, not only the user interface should be translated but also the countries where the system will be applied should have their native language integrated as speech technology to demand actions and facilitate the users' interaction.

Requirement #31: Portuguese, Swedish and Hungarian Language should be available on the user interface and speech integration.

The remaining high barrier, Overload and Work can be fought with an easy solution, providing a possibility to evaluate the seniors' results and give feedback in a simple and fast method (Requirement #16).

C. People in Care

The senior's quality of life is generally good at different countries, as illustrated on the Figure 55 below.

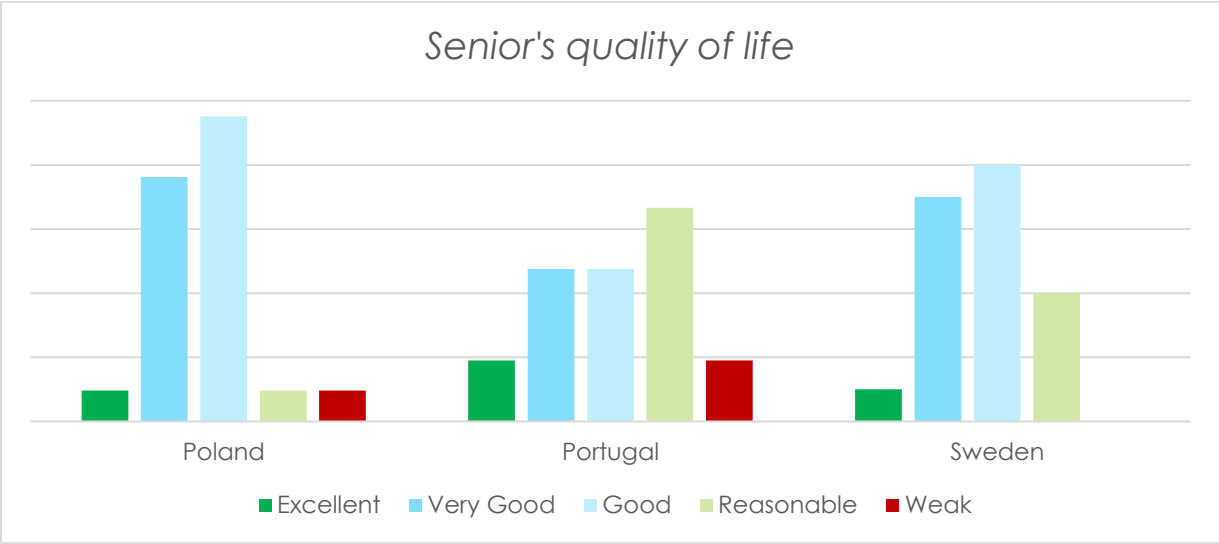


FIGURE 55- SENIOR'S QUALITY OF LIFE

From the Figure above, the quality of life is in average on all counties Good, having the highest levels in Good and Very Good, in Portugal the results are very dispersed and in Sweden there are no weak conditions and the overall results are satisfactory.

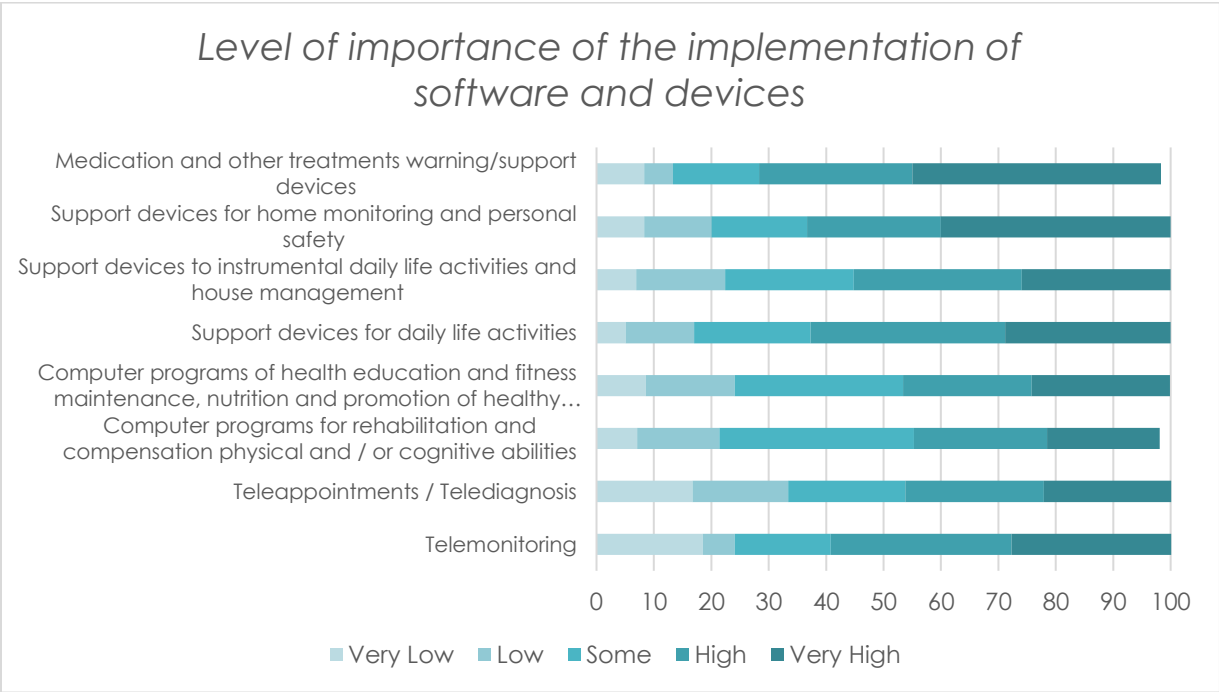


FIGURE 56- LEVEL OF IMPLEMENTATION OF SOFTWARE AND DEVICES

The Level of importance of the implementation of software and devices is represented on the Figure 56. The two main important topics to implement are the Medication and

other treatments warning/support devices and the support devices for home monitoring and personal safety.

While the first point is already identified in the Requirement #21, the need of having a support device for home monitoring and personal safety will not be mentioned due for being only at research purpose within the time on Project.

The other two important implementations revealed by the Formal Caregivers (having high or very high level of importance with more than 50% of the opinions) on the support devices for daily life activities and Telemonitoring – both topics already identified as user requirements, more precisely on the Requirements #26 and #25, respectively.

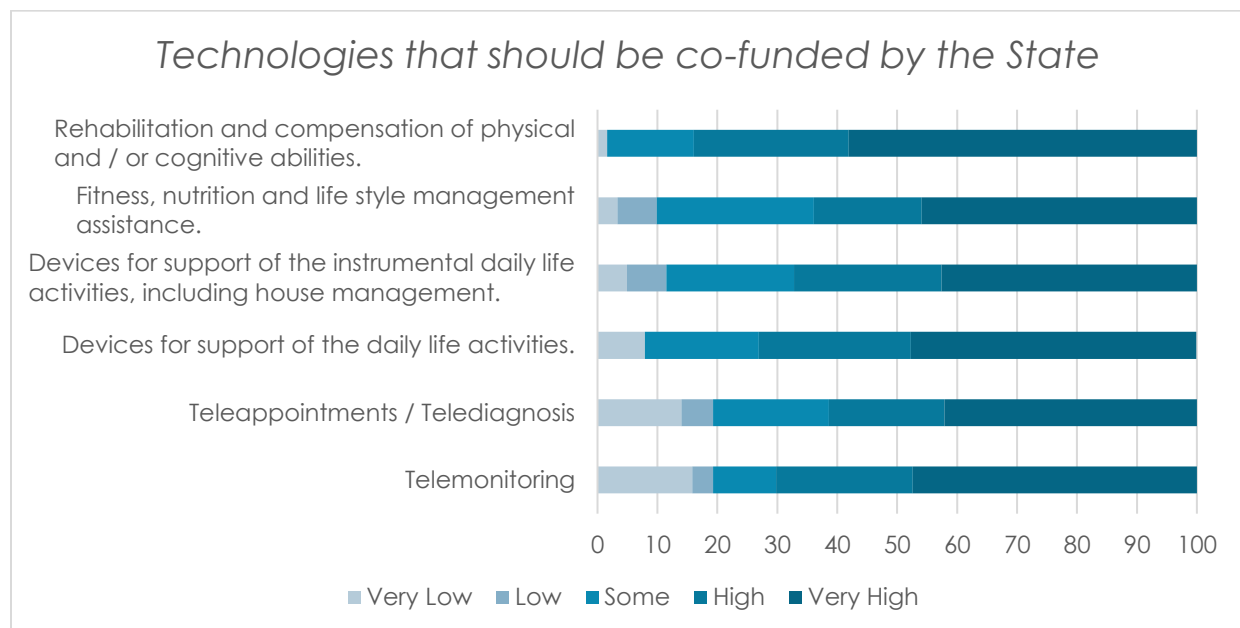


FIGURE 57- TECHNOLOGIES THAT SHOULD BE CO-FUNDED BY THE STATE

D. General Feelings

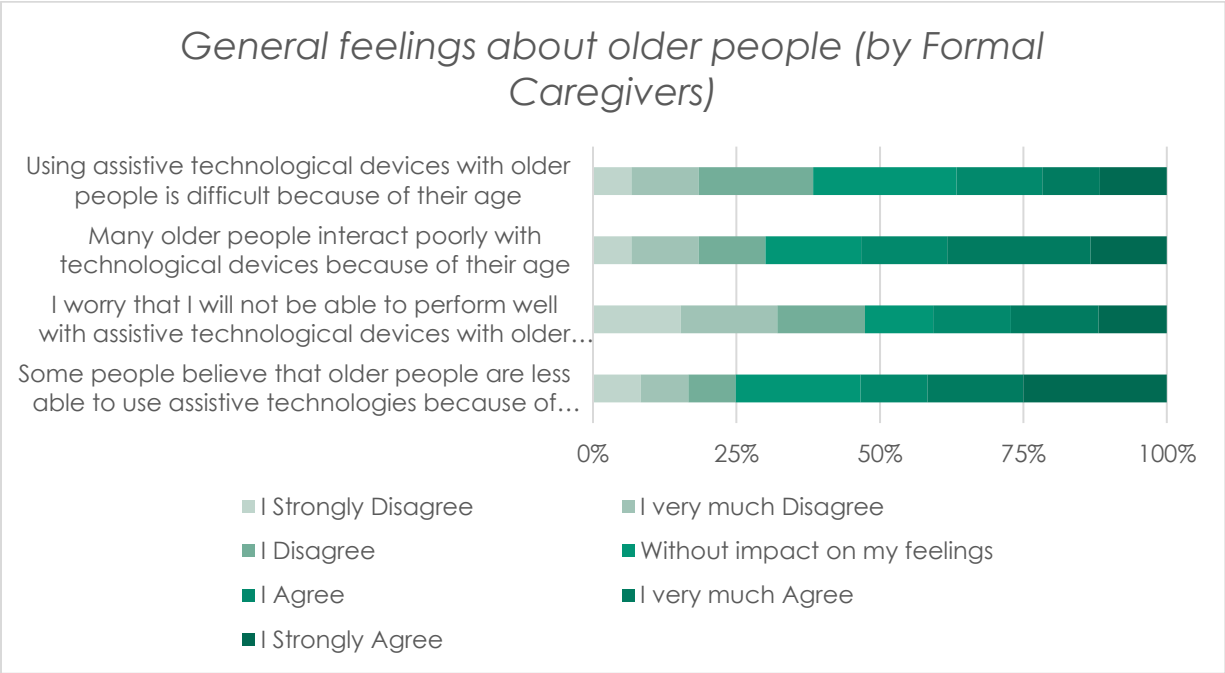


FIGURE 58- GENERAL FEELINGS ABOUT OLDER PEOPLE BY FORMAL CAREGIVERS

As the Informal Caregivers, the Formal Caregivers are also slightly uncomfortable on using assistive technological devices with older people and these interact poorly with technological devices due to their age. Besides these facts, the Figure 43 reveals other general feelings about older people by Formal Caregivers, as they are not concerned that they will not be able to perform well with assistive technological devices with older people and they are somehow influenced that society in general sees the older people are less able to use assistive technological. The Informal Caregivers and Formal Caregiver perception are very similar about general feelings of older people.

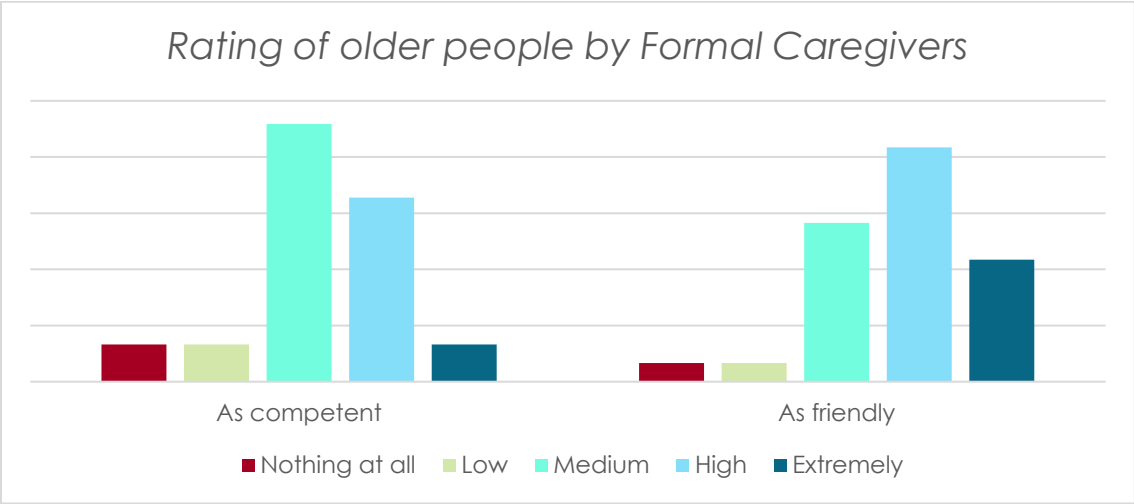


FIGURE 59- RATING OF OLDER PEOPLE BY FORMAL CAREGIVERS

The raking of competency and friendliness results of older people by Formal Caregivers are represented above on the Figure 59. The Formal Caregivers perception on the competency are just slightly lower than Informal Caregivers' perception, but they also consider as medium competent. Also the friendliness raking is lower here comparing with the Informal Caregivers' results, with the majority of the Caregivers classifying the friendliness as high or medium.

The results from the rankings of older people by Informal Caregivers and Formal Caregivers expresses the obvious stronger connection between seniors and informal caregivers. This connection with Formal Caregivers can be improved with a solution that enables a directly communication between them, by an easy and quick change of information. Nevertheless, the participation of the Informal Caregivers in the evaluation and control of the seniors are very important for them.

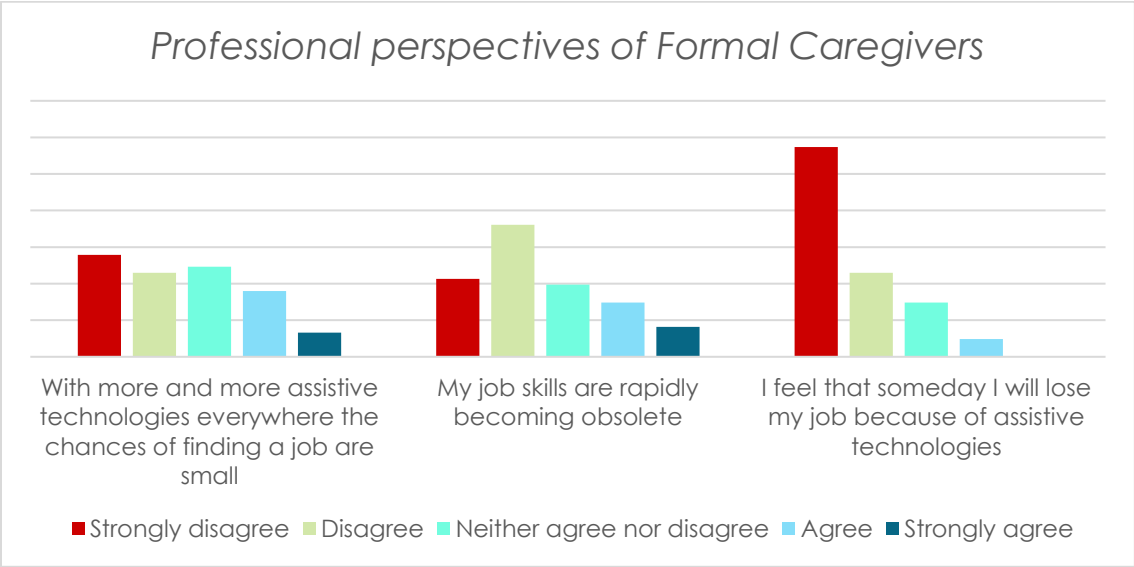



FIGURE 60– PROFESSIONAL PERSPECTIVES OF FORMAL CAREGIVERS

The professional perspectives of Formal Caregivers goes much in line with the Informal Caregivers opinions expressed, but in slightly more agreement with the perspectives reveal by Informal Caregivers. In spite of having a strong or considered disagreement with the chances being less to keep their role as a caregiver due to the new assistive technologies, with their caring skills are becoming obsolete and with losing their job because of assistive technologies the Formal caregivers are more worried and aware of the advance in assistive technologies.

From the In-depth questionnaires on the three types of users identified – Formal Caregivers, Informal Caregivers and Seniors, the following conclusions are listed below, respectively:

Analysis of in-depth interviews with seniors identified:

1. A positive impression on health care;
2. Do not want to be seen as an elderly in the eyes of society;
3. Want to stay independent as much as they can – can feel humiliated if anybody would need to help them;
4. Easy to communicate with health care personnel, nevertheless it is unpleasant to repeat their medical history to different doctors;
5. Importance to have something to make sure of the health conditions of elderly people;



The analysis identifies the importance of the solution to have a solution that promotes the active ageing, helping senior to feel more independent as possible and at a same time that monitors their health conditions. The communication with caregivers reveal an inconvenience on having to repeat their medical history which leads to a new requirement.

Requirement #32: A profile page on the system that shows seniors' health information that can be shared with their consent, including medical history.


Analysis of in-depth interviews with Informal Caregivers identified:

1. Requires a considerable time to take care of "their" people;
2. Senior's need someone to help them on obligations (as paying the bills);
3. Poor vision affects the carers to perform activities at home, such as turn the TV on or dial to their friends or family;
4. Social disconnection – depression;
5. Importance to measure blood sugar levels and medicines taken by the carers;
6. Importance to call assistance in case of emergency.

The above analysis from the Informal Caregivers revealed an advantage of a system to save time for carers, that could help seniors to perform daily activities and that it will not create a gap between them and society. A system which enables them to communicate their health conditions with their friends and relatives will help to fight seniors' depression and enable a fast method for monitoring them. A memory support system will help them to manage the senior's obligations and more importantly to manage all health care activities.

Analysis of in-depth interviews with Formal Caregivers identified:

1. Lack of communication between staff and also with elderly people;
2. Lack of knowledge for medical procedures – importance to implement training on health care.
3. Lacks of efficiency on their work without an ICS system is difficult to record and memorise patients' activities;
4. Importance on how the seniors are treated for them to be happier and part of society – treat them well in things that might be small or insignificant to many people, but as for experience, the seniors require care support with attention to details, professionalism and kindness.
5. Importance of having an alarm warning for the formal caregivers as they are do not need to be in present with carers; but also to the elderly for them to feel safer. The privacy can be violated with cameras for monitoring the activities – this can be a barrier to implement what it would be a useful method for monitoring elderly people, as the video monitoring.



Considering the requirements already collected in the document and the analysis of the in-depth interviews on Formal Caregivers, it is important to address a need for these users on the lack of knowledge on medical procedures and being unused with ICT systems.

Requirement #33: A User Guide Manual to explain the functionalities of the application.

4.4 New Requirements collected from pre-trials

There was identified the need of an Agenda Functionality to attribute actions to the seniors' events with the caregivers - an agenda that is shared between patients and caregivers, where the caregivers can monitor not only the health data, but also the events linked to a determined senior. The caregivers can propose events to each senior (e.g. as a medical consultancy or for taking medication) e the actions of those events are filled accepting those events/commitments.

Requirement #34 - Agenda Functionality for caregivers to attribute events for seniors.

Another need collected from the pre-trials was the improvement of the OLA interface, as the end users revealed some difficulties in reading some functionalities, due to the user interface was not adapted to the silver age users. Considering this note, the development team adjusted the interface by improving the resolution of display for the menus and make them better readable (Requirement #35).

Requirement #35 – Adapt the user interface to silver age users.

The users pointed that the panic button should work with a wider distance from the raspberry pi, allowing them to be at another home rooms and having the possibility to call for assistance with the panic button.

Requirement #36 – Allowing the users to use panic button from a wide distance of the gateway.

The users suggested that would be necessary to do some adjustments to the SR, as there were some voice commands that were not user friendly and some not logical to be said considering the respective action associated and the end users targeted for OLA.

Requirement #37 – Use voice commands in SR that are more user friendly and adjusted for OLA end users.

4.5 User Requirements' List

The user requirements were collected from the survey analysis and in depth interviews on Seniors, Informal Caregivers and Formal Caregivers and are listed below, according to their type and priority.

Notes:

- The type of requirement is classified as FR for Functional Requirement; IR for Interface Requirement; OR for Operational Requirement; RR for Resource Requirement; PR for Portability Requirement; SR for Security Requirement.
- The priority of each requirement is classified as shall, should, may, can.

Requirement	Requirement Type	Priority
R#1: A solution to provide a permanent contact with senior's relatives and friends.	FR	can
R#2: A solution to evaluate the chronic diseases.	OR	can
R#3: A solution to prevent new chronic diseases.	OR	can
R#4: A solution should be a memory support, helping seniors to remember appointments of personal and other topics of interest.	FR	can
R#5: A solution to easily measure the Physical Activity.	OR	can
R#6: A solution to easily measure the Blood Glucose.	OR	can
R#7: A solution to easily measure the Arterial Tension.	OR	can
R#8: A solution to easily measure the Heart Rate.	OR	can
R#9: A solution that eases the access with Health Care Units, including Physiotherapists, Nurses and Doctors.	FR	should
R#10: A solution that enables direct contacts with Rehab and Health Centres.	FR	should
R#11: The service must enable online communication to their two major priorities – Family and Public Services with touch and speech integration.	FR	can
R#12: A platform with a simple and easy to use application, considering a significant lack of knowledge on technology by silver age citizens.	IR	can
R#13: Develop a robust security platform, where the seniors' data can be safely stored and users be able to recognize a trustful and secured solution.	SR	can

R#14: The use of technology with the platform must help to integrate seniors and feel more part of society.	FR	may
R#15: A solution to support on the necessity of keeping older adults independent and actives in their homes.	FR	may
R#16: A solution designed for enhance the Caregivers' efficiency, by providing them the possibility to evaluate the seniors' results and give feedback simply and fast.	IR	can
R#17: A solution to reduce Caregivers' costs on providing them support both Technical (all functions available to analyse results and communicate with patients) and Medical (interpretation of Health Data results) assistance.	FR	can
R#18: Enable Informal Caregivers to receive help assistance in case of emergency.	FR	can
R#19: An online platform to enable the assessment of Health data of the persons in their care at any time.	FR / SR	may
R#20: Ease communication and health data sharing between Caregivers and persons in care.	IR / FR	can
R#21: Manage the activities of each person in care through a Caretaker Portal.	IR / FR	can
R#22: A solution to easily measure the Weight and Body Balance.	FR	can
R#23: A solution to enable communication between Informal and Formal Caregivers, providing sharing of health and well-being knowledge.	RR	shall
R#24: A solution with email integrated to enable and ease communication between the seniors and their caregivers.	FR	can
R#25: The health data measures should be readable on the most common devices, including mobile/smartphones, portable computer and tablet.	PR	should
R#26: Inclusion of services to support Instrumental Daily Life Activities.	RR	may
R#27: Integrate an online shopping of Clinical Material for the Organizations.	FR	shall

R#28: E-Learning Platform with relevant information to be shared between Formal Caregivers.	RR	shall
R#29: A Caregivers Portal to manage the patients' information.	FR / SR	can
R#30: Considering the dependency on the technology equipment, the solution should be available for devices with low requirements.	PR	should
R#31: Portuguese, Swedish and Hungarian Language should be available on the user interface and speech integration.	OR	can
R#32: A profile page on the system that shows seniors' health information that can be shared with their consent, including medical history.	IR / SR	should
R#33: A User Guide Manual to explain the functionalities of the application.	RR	can
R#34: Agenda Functionality for caregivers to attribute events for seniors.	FR	can
R#35: Adapt the user interface to silver age users	IR	can
R#36: Allowing the users to use panic button from a wide distance of the gateway.	PR	shall
R#37: Use voice commands in SR that are more user friendly and adjusted for OLA end users	FR	may

TABLE 2- REQUIREMENTS TYPES AND PRIORITIES



5 End user engagement

The assessment of the end users in the OLA solution can be analysed on the data collected from the surveys and questionnaires. In this section it will be analysed what are the expectations of the end users considering the ease of use in order to feel satisfied by using OLA. The level of acceptance on using a virtual assistance that is monitoring the health and well-being of the seniors will be analysed in their perspective and on the respective caregivers. The conclusions from these two points will determine important criteria for the solution validation.

5.1 Usability

Seniors


The seniors are keen on using the fixed phone, the majority do not own a smartphone, while only half of the participants owns internet and are not used to applications and technical devices. In spite of technological barrier, there is also a high percentage of these individuals who have difficulty on using technological devices. The unfamiliarity with internet and technical devices also creates trust issues on these, being more difficult for them to use and rely on the system in terms of accuracy and trustiness.

Informal Caregivers

The informal caregivers look for an application which can improve their efficiency while are taking care. They prefer a system that access the data in a fast and easy way, and which can also be permanently available. The informal caregivers would refer a system where they can easily get in contact with the person or persons that are in care. Nevertheless, their role would be more to supervise the activities and monitoring their measurements activity, while the medical examination and health monitoring should be preferably performed by the Medical Services.

Formal Caregivers

The usability for the envisioned solution would be a solution that could monitor the health and well-being data, which incorporates a good communication module implemented, that could ease the process of requesting and sharing information related to health. A



caregivers' portal was identified as beneficial for managing the patients, general information, historical diseases and other useful information. The Formal Caregivers have also expressed the importance and preference in nowadays on Telemonitoring – the possibility to monitor the data remotely would increase significantly the caregivers' efficiency.

5.2 Acceptability

Seniors

A great majority of the participants live alone or with their spouse. This trend is unlikely to change in the next years and even decades. Actually, this issue needs to be faced as a reality that you be likely to find next door, the seniors nowadays, as the future generations, will be looking for solutions and alternatives for them to track their health and data – but with such a deeper gap between them and the fastening technology development which kind of help will the seniors be willing and desiring to have?


Besides the seniors been living alone or with their spouse, more than half are unhealthy, with the chronical diseases and memory degradation being the most common issues. The seniors had shared that would be beneficial to have a solution to support their health problems, in special the level of physical activity and the arterial tension in spite of having a similar level of percentage on difficulty to use the respective devices.

Informal Caregivers

As said above on usability, the informal caregivers would prefer the Health Services to control the medical examinations and health monitoring as this could bring them a feeling of peace of mind and not forcing them to quit their job or adapt their working hours. Taking care of their relatives or friends is usually considered a second job, where if there is more than one person to take care, the majority of informal caregivers requires different moments to make it. They also look for an affordable solution in terms of material, communication and interpretation of data. The acceptance of the informal caregivers is then focused on the efficiency and cost reduction.

Formal Caregivers

The Formal Caregivers identify the communication as an important aspect, and despite the lack of knowledge in technology be the seniors, these like to feel independent. Nowadays, people like to be independent, an in case the senior uses the solution, it would be beneficial to have multiple ways to communicate and interact with other users



when using the solution. For the Formal caregivers, they can be in charge of a considered number of seniors, which for these aspect the system would need to be easy to integrate with multiple users. The system should be affordable by having the possibility to monitor a wide group of individuals with a shared equipment and reduced costs.

5.3 Validation Plan

Both caregivers, Informal Caregivers and Formal Caregivers, are slightly uncomfortable on using assistive technological devices with older people and these interact poorly with technological devices due to their age. Currently, the senior community has still a great difficulty to interact with technological devices. The OLA solution will be validated by the three different type of users: Seniors, Informal Caregivers and Formal Caregivers by the criteria mentioned above.

Both the Informal Caregivers and Formal Caregivers identify the high advantage to have an Agenda for monitoring the seniors' activity, a shared agenda between the seniors and the caregivers to ease the communication and the monitoring process between them.

In order to be an effective and cost reduced system, the OLA system should be an integrated system for multi users. By this method, the OLA system would be significantly reducing the costs for the Health Services interested to acquire the solution as the devices could be shared. The Formal Caregivers also requisite the functionality for managing the general information of all users, including the contacts and historical diseases, by having a control of the data inside the institution easing the communication process of the different levels of departments and medical staff.

6 OLA Scenario

This sections describes the original concept of OLA and the following two scenarios. The concept idea, used on the conducted surveys, includes the current scope with the addition of research that were kept for research purposes. The Health and Well-being scenarios represent the two scenarios which the project is aiming to and are in line with the analysis from the surveys above – both are represented in detail on the chapter Personas and Scenarios.

IT Devices needed for this task:

- Desktop/laptop
- Tablet

Software needed for this task:

- Browser
- 'Irina' Application

Scenario of the original concept of OLA

John, 67, is a retired sales manager living alone in a small city. His only relative, his daughter Anna lives near but is professionally very active. John loves his independence but feels that many aspects in his life are difficult to manage.

Anna is concerned about her father's health and contracted Anthony, a formal caregiver to help them. Anthony visits John in the morning but sometimes his support is needed more frequently. Therefore, John and Anna have decided to install an advanced platform (OLA) to help them organize their daily life.

John is not used to computers and has problems using the keyboard and mouse. He is therefore very glad to communicate with the OLA system using voice. For example, he can ask for medical assistance using voice and can create tasks that are automatically sent to the associated caregivers. OLA communicates with John and can inform him about daily schedules, medication or read his daughter's emails.

John has to pay attention to his diet and nutrition habits. The OLA system automatically estimates how often and what type of food John ought to eat and

suggests him appealing dishes and creates a list of ingredients, to be printed or sent to his daughter or Anthony, or automatically ordered in his e-store.

The platform is connected with a home-health-monitoring app which not only collects data (e.g. heart rate) but also tries to predict the consequences of John's living style and nutrition habits. For instance, the system correlates what John ate with his actual health status (e.g. allergic reactions, diarrhea) and learns to warn him about possible side-effects. In case of risk (e.g. irregular heart rate, extreme fatigue) the system may ensure an alert to a local medical emergency service.

Additionally, John had a bad experience being robbed a few months before. Now John feels safer with OLA because it has smart monitoring capabilities, can detect unknown people nearby and facilitate calling for help in case of emergency (e.g. intruders, feeling bad).

The advanced recognition algorithms are used in many other scenarios such as interacting with connected devices (TV) or apps (tablet or laptop), checking emotions, mood and detecting mental disorders.

John often forgets where he left his keys and documents but now the OLA platform helps him to locate them using augmented reality. This solution can also alert him for domestic barriers, such as stairs or steps.

OLA gave control back to John, Anna and Anthony!

6.1 Task I - Typing on the touch screen of a smartphone

In this task participants have to search/type certain pre-written phrases using <http://www.bing.com/> .

The Swedish phrases are the following:

- *Hur får man till sjukhuset?*
- *Glutenintolerans*

The Polish phrases are the following:

- *Jak dostać się do szpitala?*
- *Nietolerancja glutenu*



The Portuguese phrases are the following:

- *Como se vai para o Hospital?*
- *Intolerante ao gluten*

6.2 Task II – Multi-touch on a tablet screen

In this task participants will be asked to search for photographs stored on a tablet and find specific details on some of the photographs. This task will demand them to inspect, enlarge/reduce the picture with two fingers or double touch, and swipe thru the photograph and/or photographs with one finger on the screen.

Instruction I:

1. Open My Picture folder;
2. Choose a picture and open it;
3. Look for <any specific detail>
3. Enlarge/reduce the picture if necessary;
4. Close the folder and return to Home screen.

Other task can be the use of Bing Maps to search where they live.

Instruction II:

1. Go to <https://www.bing.com/maps/>
2. Find the district where you live;
3. Enlarge the map so that you can see clearly the street you live in.

6.3 Task III – Use of online resources and technologies in Irina:

Instructions III:

1. Finding relevant information:
 - a. From the main menu say: “Find my services”
 - b. Say: “Look for nearby pharmacies”



- c. Say: "Go back to the main menu"

- 2. "Read" the latest news:
 - a. From the main menu say: "News"
 - b. Pick any news article by stating the first 3 words of the news article title
 - c. Say: "Read me this article"

 - i. Checking the weather:
 - d. From the main menu say: "Show me the weather"
 - e. Press the 48 hours forecast
 - f. Listen to the forecast

When the forecast is over say: "Go back to the main menu"

7 Personas and Scenarios

In this chapter are presented the Personas and Scenarios considering the OLA solution for both the Health and Well-being scenarios.

7.1 Health Scenario

7.1.1 Senior



Maria

79 years old

Lisbon

Widowed

Retired

Two sons and one granddaughter


Gets help from Diana a Direct Action Assistant

Backstory

Maria lives alone in her apartment in Lisboa. She attended and graduated professional school and owned a small business with her husband. When he died she sold the business and retired. She has a lot of friends and acquaintances made when she ran her little grocery shop. She is not capable of performing house chores on her own, while climbing stair or walking for long periods of time because she gets easily tired and feels chest pain. Every time she needs help she calls Diana a Direct Action Assistant of her area of residency or one of her sons who live in Oeiras. When she is at home though, she sometimes feels a little lonely.

Health Information

Maria was diagnosed with *diabetes* at the age 45. More recently, Maria was forced to focus also on another health concern from her *angina pectoris* that requires her to take medication on a daily basis. Lately she has been feeling some memory problems and is



afraid she will forget to take her medication. For these reasons she is not satisfied with her current lack of health assistant.

Technological knowledge

Maria owns a cell phone which she regularly uses to talk with her friends. She does not own a computer but her friends have talked to her about how useful it is. Even though she thinks she does not have the income to afford a computer but might have for a tablet or smartphone and is willing to try it out. She would afford to pay something like 1€ to 14€ a month for any assistive technology.

Fears and Frustrations

Lately Maria has seen many of her friends become ill and not being able to remain as active as usual (social life / health). She is very saddened by this and fears that she might lose her friends or that the same thing might happen to her. Maria's biggest fears are forgetting to take her medications (mental well-being / health). She is feeling her health declining especially when it comes to walking or climbing stairs, which causes her to face old age in a very negative way. Additionally, because she lives alone, she fears that, if something happens to her, such as injuring herself at home, she will become a burden to her children.


Motivations

Maria would really like to improve her overall health, specially her memory. She would also like to have solutions that could help her be more independent in the house (safety), easing the burden of having to perform everything on her own and feeling tired and in pain all the time. She would also like to learn how to use a computer or tablet, especially to keep in touch with her friends when she is home alone (social integration).

Scenario

Maria lives alone but she often calls one of her sons for help, since he lives in the close towns. She suffers from a health condition that requires her to take medication on a daily basis. She also has difficulties performing house chores on her own because she gets easily tired and feels chest pain.

To improve her overall health and allow her to be more independent in her house, Maria and her son decided to subscribe the Organizational Life Assistant (OLA) service through the recommendation of Diana (Direct Action Assistant). At first, she thought she would



not be able to afford it because her retirement pension is very low. However, the OLA system was very affordable and her son also helped by supporting a portion of the monthly costs. He even bought her a tablet so she could easily interact with OLA. In the beginning Maria had some difficulties with the application but quickly adapted. Diana accompanied the implementation process and regularly check if Maria was adapting well to the system. Maria communicated with OLA mostly using voice, though she sometimes found it useful to interact with OLA using touch. Since she has a low education level, she liked the fact that she could use OLA to write down notes simply by dictating them.

Maria occasionally experiences memory problems. For instance, she is very worried that she will forget to take her medication. Since she started using OLA, she has been able to manage her medication intake much better. Besides alerting her when to take her medication throughout the day, it also specifies which and how many pills she must take each time. Maria is very pleased that OLA informs her when the medication is about to run out and helps her know when it's time to order more. This is possible because OLA keeps track of her medication intakes, including date, hour and dosage, by requiring Maria to confirm the intake. Whenever necessary, Maria is also able to consult both the prescription information, such as intake schedule, and the medication information, such as side effects. In order to monitor her diabetes, it is very important to control the glucose measurements and the medication associated to this disease.

Having heart problems Maria regularly measures her heart rate. Before she was not always sure if the results were correct. Now when she has OLA she is not worried anymore. The system communicates with her pulse oximeter and heart pressure monitor and in case of any abnormalities informs her and her son immediately.

Now that she uses OLA, Maria feels much more independent, as she does not need the help of her son so often. She still contacts him and his other children quite frequently using OLA, either through phone or tablet, which has also helped her address her feelings of loneliness.

7.1.2 Formal Caregiver



Nina

32 years old

Lisbon

Single

Direct Action Assistant

Professionally Active

Backstory

Nina is a nurse at a large hospital. She is a single mother with two children. About half of her regular working hours she is visiting people in their homes for medical procedures such as administering medication or taking tests. She is having a hard time trying to manage both a family and her job, this is causing a lot of stress to her. She visits her patient Maria once a week.

Perceptions regarding senior patients


Nina likes his elderly patients and has a good rapport with them. However, she is concerned that she does not have enough time for them. Many of the elderly she visits are lonely and she often feel bad leaving them after only a short visit. Much of her time is spent in transit between her patients rather than with them.

Technological knowledge

Nina is comfortable with using a computer, tablet or smartphone. In her private life she is using them all the time. The use of these devices are a natural part of her everyday life and it is not really something that she thinks about.

Technology in the working environment

She uses computers and web based interfaces several times every day and can see the upside of using ICT. Although she feels that the solutions that she gets are not really mature enough for using with patients. Sometimes she suspects that the some of the new solutions are put in place to give make the bosses look good rather than to help the



patients or the staff. She thinks that one of the best features of ICT is how it helps connecting people.

Scenario

Nina is deeply dedicated to her work as a caregiver. She treats her work as a mission. Before she discovered OLA platform she was very frustrated about the technology usage in her professional environment. She works as an independent caregiver, mostly in people's houses, because of that she has a chance to try many technological solutions nevertheless she was not satisfied so far. Now she has OLA – the platform that she installed on her smartphone, tablet and portable computer. With this new system she feels she can really do something helpful for her patients. She believes that this solution really works! This multifunctional solution lets her be in touch with her caregivers even while she is away. The platform is also installed on the devices in her patient's homes. Those devices have wireless connection to medical equipment for health monitoring. Data from measurements taken with the help glucometer, heart rate meter, blood pressure monitor or scale is automatically transmitted to the system and Nina as well as her patients have immediate access to it. The system alerts Nina and other caregivers in case of abnormalities or life danger.

Nina often coaches her patients how to use other OLA's features. How to use OLA's virtual assistant to dictate messages and mails using voice, how to communicate with friends and family members by video calls. OLA simplifies to Nina her work in many other ways. Now she has better access to rehabilitation and nutrition programs. She can customize these programs along with her patients' needs. She is very proud because many of her patients learnt how to use OLA's calendar to schedule their appointments, daily activities and treatments. The OLA platform also allows Nina to easily manage her calendar. She arranges appointments for her patients and the platform sends notification to their devices. Now they never forget about her forthcoming visits. Nina uses the platform to remind her patients to take their medicines and also to see if they are actually taking them something that was hard to know before she started to use OLA.

Nina uses OLA to monitor the health of Maria. He started using a digital blood glucose meter that uses wireless communication to upload his measurements to the OLA platform. Because this information is registered in his OLA health record, Nina is able to keep track of his current and past glucose levels, including its evolution over time and to check if he is complying with the measurement schedule. She can update health-related information to his OLA health record frequently, so that his family can stay informed about

his health at all times. By using OLA to monitor the health of Maria, her family, is feeling less worried about her health and has been able to stay more relaxed and less distracted.

7.2 Well-being Scenario

7.2.1 Senior



Teresa

71 years old

Oeiras

Married

Retired

One son and three grandchildren

Gets help from her son Pedro and is monitored by her doctor Luís

Backstory


Teresa lives with her husband in a good house in Oeiras. She attended and graduated primary school. She is a retired seamstress. She is a very dedicated grandmother and between house duties and taking care of her grandchildren she barely has time for any other activities, although she doesn't go without her Sunday walks with her husband. Her son Pedro is very present in her life and regularly helps Teresa and her husband especially when it comes to technology.

Health Information

Teresa overall health is good but she has been feeling some challenges while climbing stairs or walking for long periods of time. After going to the doctor she was diagnosed with coronary artery disease and she is very concerned about it and it has lately having more attention to the physical effort taken.

Technological knowledge

Teresa has a cell phone which she regularly uses to call her son and grandchildren. She does not own a computer or has never used one. She is willing to learn how to use



technology because she has seen her son and grandchildren use it. She would be willing to spend 15€ to 59€ a month for any assistive technology.

Fears and Frustrations

Teresa's biggest fear is losing her walking ability (health). She is afraid she won't be able to keep up with her grandchildren and take care of them as she likes so much to do (mental and physical well-being).

Motivations

Teresa would really like prevent her disease from escalating. She would like to manage her schedule better in order to spend time with her family and also take care of herself.

Scenario

Teresa lives with her husband. Most days, she barely has time for other activities besides performing her house chores and taking care of her grandchildren. Ever since she was diagnosed with coronary artery disease, she fears that she may lose her walking ability. She has already started experiencing some mobility issues, for example, when climbing stairs or walking when for long periods of time.

To help her manage her schedule, prevent her health from deteriorating and improve her mobility in the house, Teresa decided to subscribe the Organizational Life Assistant (OLA) service with the suggestion of her son Pedro. Given that she is not familiar with using technology, she asked her son to help her in this process. Since OLA was available in different versions and platforms, her son decided to offer her his tablet and suggested they could download the Portuguese version to install. She was glad that she could interact with OLA using voice, since she has some vision problems.

Teresa has been able to manage her schedule more efficiently using OLA. Its electronic agenda allows her to easily access and update her daily schedule and then warns her every time she has an appointment or any task she had previously scheduled, including her medication dosing. Some of OLA features also help her save time. For example, she is able to create shopping lists that she then uses to search and order products online.

With the email account Teresa used for OLA allows her to create her own events and contact her friends, either by sending them e-mails and text messages, or by sharing these events on her online calendar. Because she wants to motivate her friends to stay healthy, she often invites her friends for her long walks.

OLA also helps Teresa to stay active and healthy. With the OLA service she started logging her weight and heart pressure every morning and whenever she goes out for her riverside walks with her husband, she brings her Microsoft Band, that can be paired with her mobile or tablet for collecting data, such as the number of steps, walked distance and heart rate, so she can monitor her physical activity. OLA then displays this information in easy to understand formats, from tables to figures, allowing her to be aware of her current activity status and to keep track of her evolution over time. This data is also automatically available to her doctor Luís and has helped him monitor her health with longitudinal data instead of sporadic data, allowing a better understanding of Teresa's health complaints.

Teresa's son, knowing the awareness Teresa has for keeping a balanced diet, he got a balance scale to be integrated with OLA. The OLA service displays not only reminders for checking the weight, but also saves a history for her weight measures which can be consulted by her doctor Luís and has helped him monitor her weight measurements, allowing him to provide certain restrictions for Teresa's diet. The other reason why her son got the scale was because the OLA service can also collect data of posture from the body balance in order to evaluate and advise measures for posture corrections.

7.2.2 Informal Caregiver



Pedro

33 years old

Oeiras

Married

Graphic Designer

Takes care of his parents (Teresa and her husband)

Backstory

Pedro lives with his wife and 3 children in an apartment in central Oeiras. He has a degree in Design and works as a graphic designer at a marketing company. He earns enough to live an independent and satisfactory life. He is a very caring son, who constantly worries about his parent's health. He regularly visits his parents since they take care of his children during school's afterhours while he and his wife are still at work.



Caretaker's health information

Pedro's mother overall health is good but she has been feeling some challenges while climbing stair or walking for long periods of time. After going to the doctor his mother was diagnosed with light *arteritis* and Pedro is very concerned about it since she takes care of his children and sometimes feels tired.

Technological knowledge

Pedro has a landline, laptop and a smartphone. He is always connected to the web through his smartphone or through his last generation laptop that he also uses to work.

Fears and Frustrations

Pedro's biggest fear is that his mother's *arteritis* gets worse or that she forgets to take her medication. He is concerned that his mother will start experiencing mobility issues if her condition progresses, such as lack of balance and coordination, or even pain in her joints. He is also worried that he is not taking proper care of her mother by burdening her with his children and is frustrated by the arguments he sometimes has with his father about that subject.

Motivations

Pedro would like to be able to monitor his mother health status, treatments and illness evolution in a non-intrusive manner. Any device to help his mother deal with daily routines would also be very likely to interest Pedro. Since he is not very secure about his approach regarding his father's worries and his mother's illness, he would also benefit from having access to caregiving skills training. He worries that his parents' house is not fully prepared to receive someone with mobility issues if his mother's illness worsens.

Scenario

Pedro takes care of his mother who was diagnosed with *arteritis*. He is always concerned about her health, since she takes care of his children which take a big toll in her health. However, his constant worries have caused some arguments between him and his father, which made him question his abilities as a caregiver. To help him monitor his mothers' health, as well as to improve his caregiving skills, Pedro and his mother decided to subscribe the Organizational Life Assistant (OLA) system with the agreement of his father. To do so, he gifted his tablet to his mother so she could communicate with OLA, while he interacted with it using both his smartphone and his laptop.

Pedro found OLA to be a great solution to monitor the health condition of his mother. He could easily access her health records, including if that week she and his father went on their regular walk and if anything had happened. As his mother started using the medication control app Pedro could effortlessly and non-intrusively check his mother current and past medication intakes, as well as other health indicators, allowing him to understand its evolution over time. All this information was easy to understand, as it was displayed in figures and other friendly formats. By knowing that his mother was reminded to take her pills and by being notified himself, Pedro felt less worried, as he could call his father or mother whenever she missed a pill. In addition, both Pedro and his parents used OLA to manage medical appointments, from consultations to treatments, by scheduling new appointments online and being reminded whenever there was one.

7.2.3 Formal Caregiver



Luís

38 years old

Lisbon

Married

Medical doctor


Monitors Teresa

Backstory

Luís has worked at a Lisbon hospital (São Francisco Xavier) for the last 12 years. His specialty is family medicine and although his patients are from all ages, seniors tend to be more common as they have more health-related problems and need closer monitoring. Having senior parents (Teresa) himself and knowing the challenges they face, he has always tried to give special attention to the older patients.

Perceptions regarding senior patients

Luís believes that his patients' quality-of-life is reasonable and that there is room for improvements. First of all, he strongly feels that the government should invest more in helping this population, in every aspect they can. In particular, solutions regarding daily



life activities support and medication intake assistance could have a positive impact in seniors' health and daily life.

Technological knowledge

Luís uses a PC with internet connection at work most of the time. He uses systems for clinical activity support (like SAM or SAPE) and does information research. Therefore, he has extended technological knowledge and knows how to take full advantage of the systems.

Technology in the working environment


For Luís, the use of ICT in the hospital has improved many processes that were previously complicated and time consuming, in particular the integration of patient's information and the communication between multidisciplinary teams and with the patient himself. ICT also provides a good support on screening, counselling and referring patients to other specialties. Nevertheless, in his opinion the amount of equipment available at the hospital is still low and their workload prevents them from taking full advantage of the systems. He supports the direct contact with patients and thinks that spending too much time using his computer at a consult could negatively impact his relationship with the patient.

Scenario

Luís is a medical doctor who works at a central hospital in a large city. Most of his patients are older adults, so he is well aware of the challenges they face. He believes that they need solutions to support their daily life activities, assist their medication intake and improve their mobility inside their own homes. Whenever he believes their older patients would benefit from it, Luís suggests them to try out the OLA system, and some of them have already started using it.

An example of successful OLA implementation is Teresa. OLA helps him monitor the medication intake, blood pressure and exercise schedule (Length, number of steps taken, heart rate) of Teresa. For Teresa, he has been able to create and update her medication intake schedule directly in the OLA platform, taking into account the medication effects, so she can also have access to it. With Teresa he adjusted her blood pressure medication from 1 pill every morning to 2 every 12 hours, since she had a big blood pressure drop every morning leaving her tired.

Additionally this way, Teresa is always reminded when she must take their medication, including how many and which pills she should take each time. Importantly, he is also notified when Teresa and other OLA patients forget to take their medication, as the



system requires them to confirm the intake, allowing him to take the actions he considers necessary depending on each case.



8 Conclusion

From the surveys and in depth interviews conducted to the different end users supported the collection of requirements for the seniors, informal and formal caregivers.

The personas and scenarios represented for both Health and Well-being are ready to be tested on the pilots, with the validation of the OLA prototype.

Considering the research made by the technical partners, the project converged on very clear scope, with a clear identification of which requirements could be achieved and by which level, as at the same time the scenarios were improved together with the validation of the OLA prototype. The criteria for the end user engagement was defined, giving important details on usability and acceptance of seniors and caregivers to validate the OLA solution. The three major characteristics identified for OLA solution from the user requirements are a good level of easiness, great efficiency and affordable.



Annexes

Annex 1

IN-DEPTH INTERVIEWS – GUIDELINES

In-depth interview for OLA project should not take more than 30 minutes. We ask no more than 5 to 8 main questions (topics).

INTERVIEW PROTOCOL

- Choose participants
- Short description of the OLA project (partners, goals, instruments, processes)
- Sign informed consent and ensure of the confidentiality of the interviewee
- Main part - Questions
- Record or take notes
- Check and fill in the notes immediately after the interview
- Analyze data

Choosing interviewers

When choosing interviewees, one should consider a sample that best represents the diverse stakeholders and opinions of those stakeholders. The general rule about interviewing is that you will know when you have done enough when you hear the same information from a number of stakeholders.

Interviewee groups:

- Seniors
- Caretakers
- Administration staff of Medical Centers, etc.
- Senior's family members

Interview Question Tips

- Questions should be open-ended rather than closed-ended. For example, instead of asking “Do you know about the clinic's services?” ask “Please describe the clinic's services.”
- You should ask factual question before opinion questions. For example, ask, “What activities were conducted?” before asking, “What did you think of the activities?”
- Use probes as needed. These include:
 - Would you give me an example?
 - Can you elaborate on that idea?
 - Would you explain that further?
 - I'm not sure I understand what you're saying.
 - Is there anything else?

Tips on Analyzing Interview Responses

- Read through the interview responses and look for patterns or themes among the participants.
- If you get a variety of themes, see if you can group them in any meaningful way, such as by type of participant. You may, for example, find that younger participants tend to think and feel differently from older ones or that men and women respond differently.
- You can also identify the responses that seem to have been given with enthusiasm, as opposed to those that the participants answered in only a few words.

QUESTIONS AND SUBJECTS TO BE ASKED

- Architectural barriers: ask participants about their daily routine – where they meet difficulties when moving around in their houses, is it the lack of space, lack of equipment (hand rails) or bad spatial organization indoors that can cause problems. In the questionnaires seniors declared there is no bigger problem with this although caretakers declared the opposite. What would they mean for difficulty and what is an inconvenience?
- Emotional state/Frustrations:
What do you fear most about aging? Now and in coming future.

How do you communicate with seniors under your care while you are away? How do you organize the care if you don't live with caretakers? What problem do you have in communication?

When do you not feel safe?

Would you agree to monitor your house and your life parameters continuously for your safety?

- What actions consume most time in our work as caregiver/ daily routine as senior?
- If you have any experience with new ICT technologies tell us what did and didn't work about them? – Q 3.1 Informal Caregivers (we are missing information here). If you don't use these technologies for your work as caregiver/ daily life - senior, tell us why?
- How can we minimizing difficulties in monitoring health, daily routines – in what field?
- Other problems, difficulties

Interview introduction – should be printed and signed (!!!!)


I want to thank you for taking the time to meet with me today.

My name is _____ and I would like to talk to you about your experiences on taking care of seniors (eventually: on your dealing with independent staying at home).

This interview is being done in the purpose of the OLA project:

The Organizational Life Assistant's (OLA) objective is to support instrumental and daily activities of the elderly that lives alone with living restrictions, in close interaction with caregivers. Through the integration of ICT-based solutions designed to enhance the autonomy levels of the elderly, OLA will facilitate the supply of care for older adults. OLA will help reconcile the increased demand for care with limited resources, relieving caregivers and habilitating them to care for a greater number of patients. OLA joins several functionalities: a safety and well-being advisor that will analyze the living environment through real-time analysis and augmented reality settings, as well as use previously collected personal and health data and apply emotion re-cognition sensors, silent speech technology and a contextual recorder to assist in daily life, through an instrumental memory support for daily life issues such as medical and fiscal compliances.

The interview should take less than an hour. I will be taping the session because I don't want to miss any of your comments. Although I will be taking some notes during the session, I can't possibly write fast enough to get it all down. Because we're on tape,



please be sure to speak up so that we don't miss your comments. All responses will be kept confidential. This means that your interview responses will only be shared with research team members and we will ensure that any information we include in our report does not identify you as the respondent. Remember, you don't have to talk about anything you don't want to and you may end the interview at any time. Are there any questions about what I have just explained? Are you willing to participate in this interview?

Interviewee

Witness

Date _____

Annex 2 – In depth Interviews Results – Formal Caregiver 1

Formal caretaker

Age: 57

Gender: Female


Occupation: Nurses assistant

- Could you please tell me about your work with seniors? The daily routines and if there are any specific work related difficulties that you experience in the home of the seniors.

My previous job was at a company that aided elderly persons with health care. A problem was the communication or rather the lack of communication between staff. Some did not speak Swedish well enough to understand what was required and the ones who did, even swedes, did not know enough about the medical procedures to avoid making lots of mistakes. I came up with a list system for medication that I put up in the medicine cabinet. To try to sort things out. I had learned at an earlier time that when you administer the morning medicine you would use a white plastic cup, at lunch a yellow cup, at dinner a blue cup and the evening/night medicine was delivered in a red cup. So I made a list of all the days of the week and partitioned each day into those four time slots. And so everyone who were to help the senior and give them medicine had to sign their name and what had been administered in the correct space. It is a simple solution of course, only pen and paper, but it was very clear and was appreciated a lot by both staff and seniors. I think it was the immediate overview that was the best thing.

Sometimes, you know, you were there and at the same time there was people from one or two other services at the same time as family. Everyone at once and then, the box has been ticked and it might be a long time until anyone goes there again. It would be a lot better if that could be avoided and the people could be spread out more evenly. The seniors often want the company and feel worried when they don't know when the next person will be there.

It was not only a question of pills. Sometimes it was a matter of administering insulin. I had to delegate that as well. It was a worrying situation. It is a bad situation with the home care services. It was a few years ago though and it's better now. I felt, at that time, that it really didn't work at all. The new place I work at is a lot better. At the last place most off the staff lacked any health care education., It was almost as if they only wanted to fill



out the personnel file with a name, any name. And if they knew how to do the job or had any sort of health care background or education that was someone else's problem.

I mean most people do try their best but it is a question of working with people in a vulnerable situation and it should not be handled strictly as economics.

Do you feel that this is a problem with organization then?

Yes. But not only. It is more like it has something to do with the things that are not so easy to organize. I have a colleague here that worked in the governments home care services. He's talking about things that I myself has not really seen. He was in charge of the food and delivering the food to the homes of the elderly. And it is really important that the food that was prepared was prepared and presented in the right way. Food is very important and if you get this kind of food that you don't like or that you are not used to you lose the joy of eating and stop eating properly, which then translates to a medical problem pretty fast. And there is a culture problem there as well the seniors are used to a certain type of food that is seasoned in a way that neither people from other cultures nor young people know how to make. If you don't eat you will not be around for long.


And with regards to the physical space in the home of the seniors. Do you experience any troubles there?

Not really. Before we start working in the home of an elderly person which is usually when they are to be sent home from hospital after some form of accident. A professional in work environments do a home visit to inspect the environment and they fix any issues with the apartments that could be problematic for us or the elderly.

In what way?

We look at the bathroom. If you need any rails there. We look at the doorstops. We look at the kitchen. If you need an ergonomic chair there, we get you one or a table that is easier to work at. We do some changes such as take out doorstops. You can also get a bed that can be lowered or raised so that it is easier to get into or out of bed. WE can help to put some things in the attic if there are too many things in the apartment, but that can be a sensitive issue. This is also something that ASIH (last stage health care for terminally ill patients) does, they also try to make it possible for the nurses and doctors to work in the home.

Some people need an alarm so that they can get help when they have fallen down or if they can't get out of bed and need something. Then we install one of those. It works rather well in my opinion.



The difficult thing. In my opinion is the communication between the staff. Some are educated others are not. Some speak Swedish some don't. How do you organize something like this? I think we should be grateful for the immigrants and people who come here, that they want to work with this. The pay is very low and it is hard work. I think it is the care staff union that is really bad. They don't seem to do their job. I have been on strike several times and now I left the union. I don't pay the fee for that any more. My own little pay raise I guess. In not going to work for much longer, but if we want this to work we need to pay better salaries and treat the job like the serious job it is.

Annex 3 – In depth Interviews Results – Formal Caregiver 2

Formal Care giver

Age: 50

Gender: Male

Occupation: Home care worker

-How do you communicate with the elderly persons that you care for?

It depends on each assignment and each patient's specific needs. Usually I respond to an alarm. That is if the patient is weak physically but not mentally, they have an alarm system that they can use to get help, and then they can specify what type of help they need.

-What is your experience using these alarm systems?


What happens is that often the alarms are just given to the users without proper explanation and training. And with that I mean both the user and the caregiver need to be trained in how to use them properly. You then end up with a situation where the user doesn't know how to properly use a device and there is no common ground on when to use it and in what situations is best used, that leads to misunderstandings and situations where the users don't know how to call for help even though the means to do so are right there at their side, often on the user's wrist.

-What is your opinion of using sensors in the home of the seniors that can detect the activity and health state of the person?

I imagine placing different kinds of motion-detectors in the home of the user at the place where they usually move would be a good thing. You would need to know them well though, so that you know where they want to go in the apartment. And monitors, but you can't use monitors for legal reasons so that's would be difficult. If I could decide I would have monitors installed but there is the integrity to factor in. Motion-detectors and fall-detectors are less sensitive so those can be developed and used freely I suppose.

What do you usually do on an average day when you are helping an elderly person?

Lately I have been accompanying the patients on activities helping them when they are away from their homes quite a lot. When they need to visit a hospital, go to habilitation or rehabilitation services, help shopping it could be anything really. I help out with




different things. Help with the computer or fixing the channels on the TV all this besides the actual care services that we do most of the time. If it requires heavy lifting, there are usually two of us but otherwise you are on your own. We help out administering medicines if the responsible nurse delegates it to us. It is really up to each care giver and It's not something everyone is comfortable with so it depends

-Do you have any ICT system to help you organize the care and to document the activities?

No. The nurses have a system but we don't. Again this has to do with the rights to privacy of the patients, which is important of course, but it is really difficult to know what has been done. Especially when you work nights and cannot really get the information needed, it's difficult. There are many ways that it could be done better and smoother. Looking back at all the places where I have worked it could work a lot better. We usually write a report, either on paper or on the computer. Temps can't access the systems so they write a report on paper. Come to think of it there was a system at one of the places where I worked previously, where we could write reports so that they were connected to the patient. That made things a lot easier, you could read up on the senior instead of trying to find the person that was there previously to learn about the person. That is the very core of this job. To know the people you are helping and what they need. You learn to compensate for the unknowns but it takes a lot of experience and many in this work don't have that much experience. They could really use a system like that. The threshold for receiving this type of health means we mostly help people with significant care needs and that results in a lot of information being necessary. At the start of each work shift there would preferably be an effective and concise way to get the necessary information and to have it available when you need it. This is something you just don't have today.

-Do you experience any difficulties with the physical space, such as limited room to maneuver when visiting the homes of the seniors?

Yes, the space is sometimes limited and also it can be difficult to find the things you need. But this depends on the housing situation in general. I have been in situations where it is impossible to work. With no room for the care team. Sometimes the person receiving care is very heavy and then it gets very cumbersome for all involved. You try to improvise a solution but sometimes it is just impossible. Usually it is accessibility adaptations of the apartment that have not been done properly or the space can be very problematic to begin with. The apartments need to be properly evaluated and adapted for the need of the person living there. Mostly things work fine but every now and then you go to a



home and think -Wow, how do we do this? Crowded spaces often stop accessibility technology from actually being assistive.

-On a more general note, is there anything else that you would like to have developed that would help in your work situation?

Let me put it this way. If you could control more of your situation as a receiver of care. If you want a monitor or a camera, then it should be up to you. Everyone should be able to decide for themselves. Of course there are always problems with surveillance and integrity. People are sometimes undressed for example. The added safety and uses would be great but when you work with people in a vulnerable state you tend to see a lot of things, and that could certainly be a problem. It would undeniably be useful however if the person who wants this could have access to it, but I see how it can be hard to do for all sorts of reasons. I think that it should be possible though. Myself, I would like to be able to check in on my mother sometimes to make sure she's ok. She is in another country, and she needs some help from time to time. It is very difficult, you know, she needs to say herself every time she needs help and she don't always do that. She has a few friends that help out and that is good. I would like for her to have a camera so that I could see that she is alright. Of course she would not like that. Every person needs to decide for themselves.

Annex 4 – In depth Interviews Results – Senior

Senior

Age: 74

Gender: Female


Occupation: Retired

-Could you please tell me about your home environment and your daily routines in the home, and if you experience any difficulties when moving around in your home.

I think I manage quite well, personally. But I do need "grips and handles" for support, and so did my former husband who I used to help at home. It's safer if it is something that is fixed to a wall or something else that does not move around. My former husband who had severe problems with balance and who had weak legs used to use his chair for support and then his desk and his table sort of moving along with those as support. The chair, sort of an old office chair, was on wheels so it would not be safe and it would move around. And he would fall down, or almost fall down. So, many handles and grips would be a good thing. When people get older you know their bodies lose strength and they are less flexible so they lose their balance and also they have less calcium in the skeleton and so they break their bones, their femur, more easily. The older you are the less balance and the less calcium, it only gets worse as you age.

Are there other problems with getting around at home? A lack of space for example.

Yes, that too is a major inconvenience. I have a lot of things that I have collected over the years and I think it is hard to, well arrange them and to rid myself of some of them. And it makes the house sort of crowded. It is a rare thing to have a large space like. I think perhaps it would be possible to help people with this. You get help with the other things like removing the door stops and such, but all of these things, private things that are everywhere it is also something with which you would need some assistance. Naturally I think that it is good that you get help with the fittings of the apartment, and changing taps to ones that turns easier and simpler light switches and so on. Now I think I'm pretty healthy and I still manage mostly by myself, unlike my former husband. And I do feel self-sufficient but I think that as I have gotten older I tend to make my house less and less manageable. It's a behavior that I have seen in many other old people than me, that you seem to collect to many things around yourself. Even though you can afford new things it seems harder and harder to get rid of the old things that could be useful, I don't



know why. Perhaps it is a protest against the throwaway society. At least you want to give things to someone who needs them instead of throwing it in the garbage. I don't think I am alone in feeling like this. This is a problem. I personally have a lot of coats and clothes that I would like to give away, but I don't have the strength to do so. I have taken some clothes and given them to people who needs them, but sometimes I couldn't find someone to give them to and it hard for me as an elderly person to walk around and do these things. Even the collection spots are far away, so it is hard. If there was a service that picked up things from elderly that was giving them away to charity, that picked up even smaller amounts of things unlike the existing ones that demands that you have at least five full boxes before they collect anything. Or if you could leave it by the entrance of the house a day every month like it used to be. There could be a service or something that picked up gifts for charity that would help. And most people live in small apartments where you can't have a wheelchair or a walker. You can't bring the walker indoors for example. Perhaps a walker could be built that could be folded together, like one of those bicycles, so that it could be stored easily in the hallway. It would still have to be inexpensive, mind you, we are talking about seniors here.


How do you feel about being a senior citizen? Is there something that frustrates or worries you?

I worried that in the future, the very distant future, I will not be able to manage by myself. I really do not want someone else to decide over me and to tell me what to do. The thought itself is abhorrent. And already in this society that we live in seniors are being marginalized. Marginalized and isolated. Friends and everyone that you used to socialize with die and the social circle is narrower and narrower. And as the society is divided by age, you end up alone. Me personally would never go to a seniors meeting to talk to other seniors because I don't consider myself a senior foremost, perhaps they don't either, still.

Loneliness is a serious problem. I can't say that it affects me though. I never feel lonely. But I think it is big problem from what I hear.

How about help from care organizations?

Now I get some help from my family when I need it and that is all. I would feel humiliated if anybody else would need to help me. Right now I am strong and capable. Who knows in the future. But Actually, I have had some experiences from the health care recently that was surprisingly positive. And that have changed my view on elderly care. I used to be afraid of ending up in as anonymous health care system. But now I have experienced



the compassionate and caring personal treatment of some people in health care and I am not so anxious about this anymore.

I hear there is this service that you can call if you are above a certain age that sends somebody over to your home to help out if you need help hanging up curtains or changing a light bulb and similar tasks. I haven't used it myself but it seems like a really good idea. I could consider using a service like that for helping with the cleaning or washing clothes. As long as it is not too expensive, because seniors, as you know, don't have a lot of money.

But I would still rather get help from friends and relatives. I come from a culture where family look after family, other too of course. I personally feel that family should care before anyone else.

I would still want help cleaning and washing clothes. And shopping too. If I buy three liters of milk it is already getting very heavy for me so someone to help me with the shopping would be very nice. And also I would like some sort of surveillance at the door. Nowadays there are a lot of people who are defrauding and robbing seniors. It would be much safer if there was a video camera so that you could see who they were before you open the door. And you could see if there were many people there as well.

How would you describe communicating with health care and other similar services?

I find it easy to communicate with most people in health care. Of course there are different personalities. Everyone is nice and some are nicer since that is their personality. Some are more dedicated or more generous than others but all are good. Some are just extra good. I have heard a lot and also had some experiences of my own before that was not so positive, you know. Where the institutions was impersonal and people had to wait for long stretches of time and tell you whole medical history to doctors who then sent you to someone else and you had to tell it again several times over. Very unpleasant. You feel like a ping pong ball and it makes you feel very sad and powerless.


Are there times that you feel less safe at home or in other locations?

No, not really. My neighbors and friends are afraid of going outside whenever there is snow a fro fear of falling, but not me.

Not afraid of intruders or burglars?

No!

That you might leave the window open or the stove on?



That would be useful! I often forget that I have something on the stove. I answer a phone call and you forget the egg. And then you should have a timer that turns of the stove. I have seen that in some places and I think that is a very good idea. It would also be good to have a fire alarm or something that goes off if the mean value changes to much in some reason. Perhaps a motion detector. If it is to quiet perhaps someone has fainted and if it is too loud then someone is trying to do something. I used to think that phones should be on the floor so that you can reach them if you fall and break a leg. Perhaps it is not a problem anymore now that you have cell phones though. Oh and bathrooms are dangerous places for seniors. The floors are slippery and wet and it is easy to fall in the bathtub and if you fall practically everything is really hard. You can fall onto the basin and break your head for example. If you would fall and try to grab the shower curtain it is way to flimsy to break your fall. There are many dangers in the bathrooms. Perhaps you could make all the surfaces like those non slip mats. We don't want big brother in the bathroom, but it would be a good thing if there was something making sure you are ok in there. Especially with people who are old and ill.

Any other ideas that could help seniors with their everyday lives?

That is a very open question, is it not? Yesterday I was talking to an architect who had this idea about a communal house built as a circle with a Winter garden in the middle where the residents could meet. And the building could do cooperative shopping where you could buy your food. Food is a lot less expensive when you buy in bigger quantities. People need to know their neighbors better and have a sense of neighborliness. There could be some supplies and perhaps people without a job could do the shopping and earn some money from that and from helping the seniors. That could be a special job for a teenager, or a senior.

Annex 5 – In depth Interviews Results – Informal Caregiver

Informal caregiver

Age: 49

Gender: Male

Occupation: Research Manager

Could you please tell me about the situation for the senior that is in your care?


I help my mother who is 77 years old and has problems walking and can't dress herself or make food herself. Probably have glaucoma so she also needs help paying her bills and such. I don't spend so much time with this as she has help from the municipality in that she has people coming five times per day and three times every night to look after and take care of her. She also has a fiduciary that takes care of the bills.

The problem is that it doesn't work that well. She's changed the caretaker service company four times because they don't do what they should do. Which is help her and spend time with her and prepare food. They have new people coming there all the time who don't know what should do and they can't prepare food and they put the bills all over the place so they end up not getting payed. We are sending a letter to decline the fiduciary that she was recently assigned since he never visited her or contacted me. H just changed her mail address to his own address so that all her mail ended up at his place including deliveries of adult diapers so she had none since they were at her place. it's an organizational nightmare.

Could you tell me about her home environment and daily routines? Are there any limitations due to architectural barriers in her home?

She can walk and move around with a walker, but she has problems getting up and getting back into bed herself, so she needs help. Specially to get back into bed. She needs help to get rest. She would need something to hold on to when getting up and the walker is a low tech walker. It has brakes but if she tries to get up the whole thing moves instead of giving support. Since she can't see that well, she needs help making phone calls and with the remote for the TV. Basically everything that requires her to see since she has poor vision.

We removed a lot of things but then she gets these big bags of diapers and other medical supplied that they leave all over the place and that obstructs her movement as well. She



can go to the toilet but not to the kitchen since she can't pass the doorstep with her walker. This means that if nobody comes she can't eat.

A problem is that the most of the caretakers only come there a couple of times before they are replaced by other staff as there are a lot of personnel on rotation schedules and it is not really an occupation where people stay for a long time.


How do you communicate with her and with the care givers?

It's very hard. I meet the care givers when I visit her but I don't have any direct contact with the managers. The person in charge of her from the municipality and the health care supervisor and the doctors are all different people and they all work in different organizations that have no apparent contact. And the people keep changing all the time. There is no continuity. Also my mother gets angry and refuses help from people that are rude and eventually then she changes the service provider. That further affects the continuity in a negative way and adds problems with payments and all that. And then there are problems with new people not knowing what they should do.

It is problematic. She has been on the way to get an eye operation several times. But since she can't really walk she has been confined to her apartment for a long time and has developed a social phobia and don't want to go out. Which means that every time she needs to go somewhere to do something like that, she gets a panic attack and it gets cancelled. It's really hard. It's difficult to get her to the hospital. And they don't take responsibility for it actually happening. No-one owns the problem. So if something does not work, then you have to restart everything again and try to get hold of the doctors and the administrator and everything who don't answer the phone. I can't help with this because of work. Now my father has started to help her because he gets angry about the situation, and they divorced 50 years ago. Which is strange.

You realize that the more relatives help the less these companies do. They take every penny she has. She has a very low pension and after the fees to the health care providers she left with a small amount for herself.

Regarding that they come as often as they do it is a small cost but regarding what they actually do when they are there it's not as obvious. And it is not clear what you can have them do. The municipality has given her some documents that details what her rights are, which includes getting out and getting to the doctor, but it seems that this is not communicated to the people who actually perform the service. And many of them are immigrants on their first job since it's a low paying entry job. And then there are problems with both the language and culture and practicalities. So my mother becomes



angry with them since they don't understand what she wants. You realize that it is a very difficult working situation for them. They mostly dress her and give her food, but since they claim that they can't actually prepare food they mostly warm food that has been previously prepared. They shower her once a week, other than that, I don't really know.

Myself I try to visit her and talk to her and handle her economy, or rather try to handle her economy, which is a mess. The bills are everywhere in the apartment and a lot of times the bills disappears instead of being payed.

What are your experiences with using ICT in taking care of your mother?


Since she can't see, she couldn't make phone calls so I gave her a phone that has an automatic dialing button that, when pressed, dials a list of people until someone answers. It works but it's frustrating for the first person on the list. I showed her this voice enabled controls and she wanted that so I bought her a laptop but she can't see well enough to use that so that didn't work. Now she stopped paying for internet as she doesn't use it. Maybe voice controls for calling or for controlling the TV would work for her but it would need to be very easy to use. I mean she couldn't use a computer mouse. It would be worth a hundred crowns a month or whatever it costs.

If I ask you to envision a solution that would help with this situation. What would it be?

A voice enabled interface would be the optimal solution for her, I think, because she can talk. Some kind of information hub. One problem is scheduling when people come. One problem I s scheduling. She never knows when people come and when they last were there and when she will have a shower next and things like that. People turn up without saying who they are who they are there. Something that could help get an understanding of why they are there and what is going on would be very good. A smart calendar or something. Also a connection to the bank and help with the bills. Now she has no idea how much money she has left and when she should pay her bills. Plus, she has a lot of medicines that she needs to take and she always thinks that she is not getting her meds. So she tries to trick the care givers into giving her more than she should have. She has this problem with her blood sugar and when she went to the hospital they did a measurement and it showed that her blood sugar was very low. This wasn't noticed by the people at her home. So something that helps managing that would be very useful.

Is there anything else that you think could be useful or that I should know?

One problem she has is that she falls all the time. And she has fallen at night and had to lie on the floor for hours waiting for people to come and help her. She has this alarm on her wrist but she pushes it all the time. For company or something when she gets lonely



so they don't know if when has really fallen. She will say anything to get them to come.
So something that actually could see if she fell for real would be good.



List of Figures

- Figure 1- Marital Status..... 15
- Figure 2- Household 15
- Figure 3- Number of people within the household 16
- Figure 4- Health Status 17
- Figure 5- Actual Health Status..... 18
- Figure 6- Chronic Diseases 18
- Figure 7 – Cognitive Status - Level of difficulty the seniors feel 19
- Figure 8- Cognitive Status - Importance Level to have a solution to support 20
- Figure 9- Health Care needs - Level of difficulty the seniors have to measure 21
- Figure 10- Health Care Needs - Importance Level to have a solution to support 21
- Figure 11- Health Care Units – Level of difficulty the seniors have to access 22
- Figure 12- Health Care Units – Importance to have a solution to support the access..... 23
- Figure 13- Health Care Services - Importance to have a solution to support the access 23
- Figure 14- Health Care Services – Importance to have a solution to support the access 24
- Figure 15- Priority for requesting help 25
- Figure 16- Residence of seniors' priority for requesting help 25
- Figure 17- Users of Technology 26
- Figure 18- Use Frequency of Technology 27
- Figure 19- How often seniors use the technologies/device 28
- Figure 20- Senior's vision on technologies/devices 28
- Figure 21- Reasonable monthly fee for the senior's perspective 29
- Figure 22- General feelings about seniors..... 30
- Figure 23- Rating of older people 31
- Figure 24 - Group of older people 32
- Figure 25- Informal Caregivers' Occupation 33
- Figure 26- Informal Caregivers' work frequency..... 34
- Figure 27- Taking care of more than one person..... 34
- Figure 28- Support from institutions when working as a Caregiver 35
- Figure 29- Type of Support received by the Caregivers from Institutions 36
- Figure 30- Payable Support for the Caregivers to Institutions..... 36
- Figure 31- Frequency of situations happened last month 38
- Figure 32- How Caregivers life can get negatively affected by country..... 40
- Figure 33- Dependency Level of people in care..... 42
- Figure 34- Priority Level of People in Care..... 43

Figure 35- Importance degree on Services by Informal Caregivers	45
Figure 36- Services to be improved on Caregivers' vision	46
Figure 37- Type of information the Informal Caregivers prefer to have access through their devices.....	48
Figure 38- Technological Devices by the use of systems and development of smart devices.....	49
Figure 39- Most useful Informal Caregivers' Categories	51
Figure 40- Reasonable monthly fee on Informal Caregivers' perspective	51
Figure 41- Most useful categories by country.....	52
Figure 42- Informal Caregiver's reasonable monthly fee by country.....	52
Figure 43- Informal Caregivers' General feelings about older people.....	53
Figure 44- Rating of older people by Informal Caregivers	54
Figure 45- Group of Informal Caregivers.....	54
Figure 46- Formal Caregivers' Occupation at respective organizations	56
Figure 47- Formal Caregiver's occupation by country.....	57
Figure 48- Organizations where Formal Caregivers execute professional activity	57
Figure 49- Organizations where Formal Caregivers execute professional activity by country.....	58
Figure 50- Formal Caregiver's use of Internet to work by country	58
Figure 51- Level of information and communication technologies used by Formal Caregivers	59
Figure 52- Most helpful systems to Formal Caregivers by country	60
Figure 53- Benefits of the system.....	61
Figure 54- Barriers of the system.....	62
Figure 55- Senior's quality of life	64
Figure 56- Level of implementation of software and devices	64
Figure 57- Technologies that should be co-funded by the State.....	65
Figure 58- General feelings about older people by Formal Caregivers.....	66
Figure 59- Rating of older people by Formal Caregivers.....	67
Figure 60- Professional perspectives of Formal Caregivers	68



List of Tables

Table 1- Activities with considerable dependency by priority.....	44
Table 2- Requirements types and Priorities	73