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Abstract	

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1 Executive summary

<p>Aim of the deliverable</p> <p>This task aims to prepare for the field trials (T3.4) by identifying the most important target groups of end-users that will benefit more from a particular service or group of services. It will get input from T1.4 reporting on the results of the mockup application tests. Various selection and classification criteria will be considered and justified. UML diagrams will be constructed to illustrate use case scenarios of how different target groups interact with CAMI. Some of these scenarios will be implemented in T3.4.</p>
<p>Brief description of the sections of the document</p> <p>Section 4 starting with an introductory part followed by primary user (4.1) and secondary users (4.2) classification criteria. In 4.3 we present country specific end-user groups for the three end-user countries involved, i.e. Denmark, Romania and Poland. The last section of the deliverable contains the conclusions.</p>
<p>Mayor achievements</p> <p>CAMI end-users have been classified in various groups according to their needs, wishes and/or limitations.</p> <p>Age limits for the CAMI primary users have been established.</p>
<p>Summary of the conclusions obtained</p>

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4 Introduction

WP3 aims to integrate and optimize all system elements and set-up trials at the end users' premises. This WP will provide feedback to WP2 to perform the needed adjustments and tune-up the system, gather end-user feedback and validate the platform. Field trials in real-life settings will be conducted in different countries with help of the end-user organizations. Within WP3.2 which aims at "End-user groups differentiation" we have defined and organized the end-users into different groups according to

their limitations to perform certain daily activities such as personal hygiene, outdoor activities, etc. or according to their expressed interest in receiving support even in the absence of a limitation. The input given by the end-users in WP1 was taken as the basis of the categorization. Various selection and classification criteria are considered and justified. UML diagrams are constructed to illustrate use case scenarios of how different target groups interact with CAMI.

The CAMI development strategy puts at its core both primary and secondary users. Consequently, there are mainly two types of end-user actors that interact with the system and benefit directly from it. Both primary end-users and secondary end-users benefit directly from the CAMI technology, but primary end-users are the ‘final’ beneficiaries. Secondary end-users mediate the influence of the system on several dimensions of assistance. For instance, a primary end-user (e.g., elderly citizen) may be assisted by a secondary end-user (e.g., caregiver) in performing certain daily activities or in support of certain executive physiological or cognitive functions.

4.1 Primary end-users classification criteria

The end-users can be classified according to a varying number of guiding principles or criteria, ranging in complexity from demographic separators (or categorical identifiers) to health statuses or more elaborate criteria.

However, the first selection criterion is the one that defines the primary end-users of the CAMI system. Specifically, the primary end-users are the beneficiaries of the specific technologies that CAMI provides in the field of ambient assisted living. As such, the elderly with specific health problems like cardiovascular diseases, diabetes, etc. and with potential higher acceptance rate of advanced technologies were identified at the project start to be the main primary end-users. The age limit for elderly was set, in order to increase acceptance, to slightly below 60+ yrs. of age which is roughly the minimum retirement age in the European Union. The criterion for an existing health problem is given by the existence of a limitation which requires the use of assistive technologies. Consequently, the initial categorization of primary end-users in CAMI, according to the proposed project, was as follows:

“Primary end-users will be older adults in general and adults with cardiovascular diseases, diabetes and mild cognitive impairment in particular (highest incidence for the target group). The targeted age limits are 55-65 yrs old. Our choice is justified by the already recognized (AAL projects and own experience of the CAMI end-user organizations) that the acceptability of ICT technologies is at its lowest limit in the group of elderly people (70+). It constitutes in fact one of the main barriers for its large scale commercialization and exploitation. Our aim is to target primary users who have the highest chances of accepting CAMI solution and thus have the highest benefits from the project results (technology and services). These are today’s adults age 55-60 who were not older than their 40ies (35-40 yrs) when the internet started its widespread use around 1995 and who were still able at that time to adopt emerging technologies and services in their everyday life. We expect that today’s older adults, age 60-65, are facing the lower margins of ICT acceptability. CAMI will evaluate this within its extensive end-user involvement in WP1. We will also take into account that cognitive age, or the perceived, mental age of an individual, plays a significant role in that person’s acceptance of technology.”

Regarding the age criterion which, presumably is also connected to the acceptance criterion as outlined above, the following arguments lead already to the differentiation of end-users. Results reported in D1.1 revealed that Danish end-users age 65-71 did not appear to be in great need of technical solutions for their daily activities. On the other hand, Romanian and Polish end-users appeared less familiar with modern ICT technologies even at 65 yrs old. Consequently, several possibilities were considered for

the further inclusion of end-users in CAMI. One possibility was to have age limits tuned for each country. The other possibility which was also the one adopted in CAMI was to extend the initial age limit to cover requirements in all end-user countries. The limits 55-75 yrs old were the ones adopted as age selection criterion in WP1. No other differentiation criteria were used so far and thus, the present task aims in identifying and defining such criteria, if any. Age related criteria will be further discussed among the end-user organizations in CAMI after completing the consortium reconfiguration.

Obvious criteria arise from the support offered by the CAMI modules to the limitations or needs of the end-users. These modules were described in WP2 and exploited when preparing the multinational survey, conjoint analysis and focus groups in WP1.

Table 1. Basic groups of activities together and their corresponding specific activities along with the CAMI modules/functionalities addressing them.

Groups	Generic/ broad category of activity	Specific activity	Modules/functionalities addressing the problem
Health-related	Health crisis or problem interventions	Taking first aid measures etc. Falling down Calling for help	Falling down detection Robotic platform
	Health monitoring	Recording physiological parameters	Health monitoring at home
	Health activities	Exercising Obtaining medical advice Medication	Monitoring of physical activity; computer supervised physical exercises Communication with health professionals (OpenTele, Telepresence) Reminders
Household specific / related	Daily / regular chores	Buying various items Cleaning Cooking / preparing food/Eating Maintenance	Reminders Intelligent home appliances Reminders Reminders Robotic platform
Hobbies & leisure	Socializing	Socializing Watching TV, listening to radio	Robotic telepresence

	Utilizing PC / other technology	
	Gardening, landscaping	Intelligent appliances

4.1.1 Health related end-user group

4.1.1.1 Description of the end-user group

The end-users in this group are characterized by various health conditions. The main ones targeted in CAMI are cardiovascular diseases, diabetes and mild cognitive impairment in particular. The health condition of the elderly interviewed in D1.2 was estimated through several questions in the multinational survey. Out of the 105 users from the three end-user countries 60 respondents suffer from chronic diseases such as: cardiovascular (24), diabetes (16), respiratory System (11), osteoporosis and rheumatism (8), liver and kidneys (2), thyroid problems (3), other: obesity (1), alcoholism (1), cancer (1), depression (1), digestive system (1). However, only 20% of respondents are not satisfied with the status of their health which indicates that their health problems are under control. However, this does not exclude the need for regular medical checkups and communication with health professionals.

The most profound daily obstacle among all listed is remembering about the small things and remembering about taking their medication pills (see Figure 1). Another often encountered complain was that of falling down inside the house. Nearly 30% of the participants have experience at least one such event. In the first case reminders, home automation and a robotic presence can help users. In the second case the fall and alert module will be the one supporting the users.

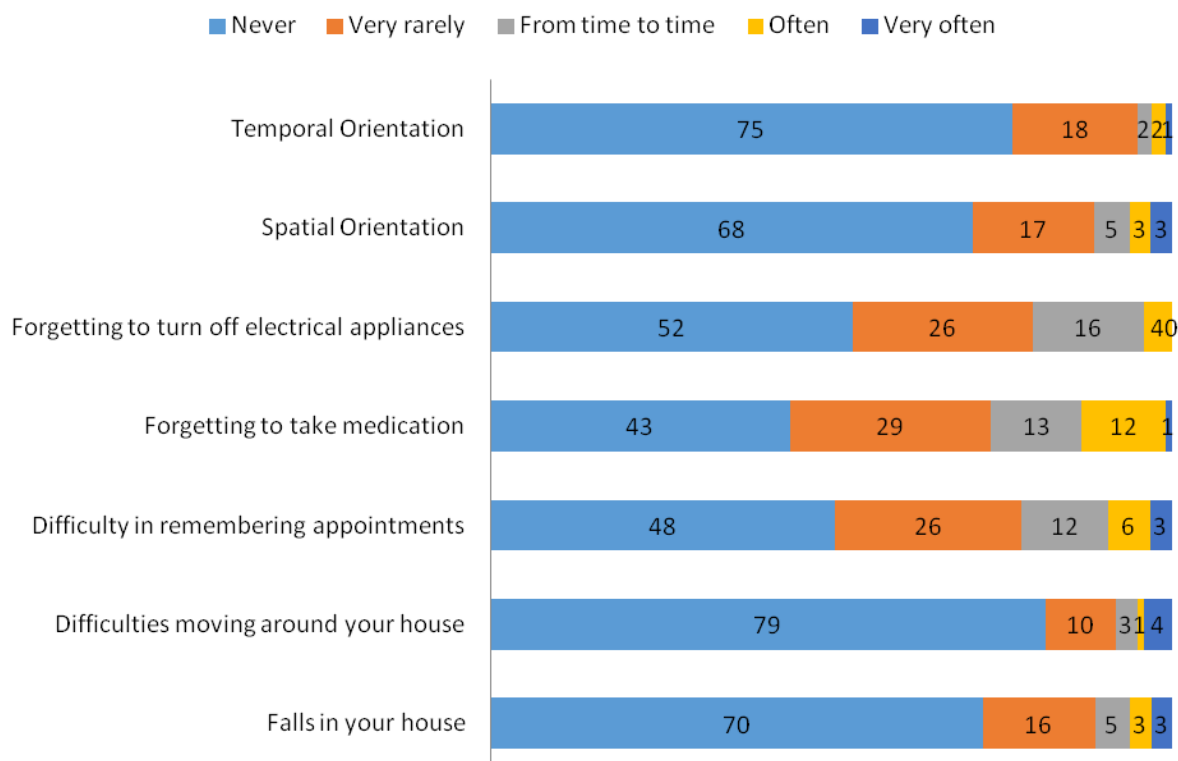


Figure 1. Limitations encountered by the users in D1.2 due to their health problems.

Among the chronic health problems reported cardiovascular diseases and diabetes were prevailing.

The end-users in these groups can benefit from CAMI services by using the health monitoring at home. They can also use the reminder module associated with the dynamic program management module to not forget taking their medication, measuring the glucose levels or doing their insulin shots. Additionally, for the insulin dependent elderly in particular but also for the other diabetic users the falling down detector is essential during hypoglycemic episodes. Also, monitoring their daily physical activity and performing regular exercises is important for tuning their treatment and maintaining a healthy lifestyle.

4.1.2 Diagrams of use-cases

A series of use-cases have been developed in D1.4 by taking into account the interaction between the end-users in this group and the CAMI platform. For example, the diagram below (Figure 2) presents the interaction with the Linkwatch module developed by CNET for monitoring various important physiological parameters (e.g. blood pressure, blood glucose, heart rate) at home.

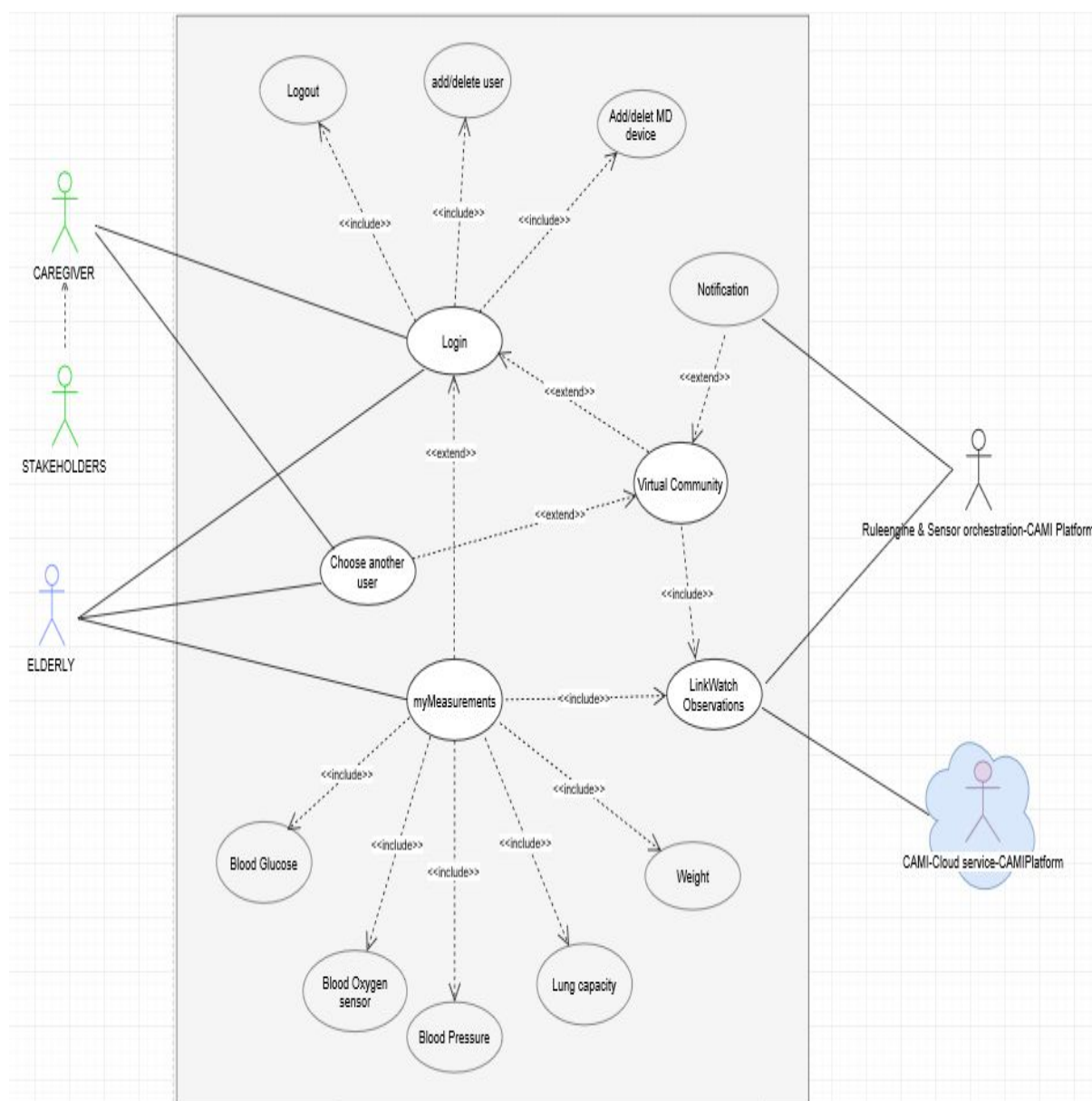


Figure 2. UML diagram of the interaction between primary and secondary CAMI users with Linkwatch.

The Linkwatch module can help monitor both the cardiovascular and the diabetes groups described

above. For both groups, in addition to disease specific parameters (i.e. blood pressure, heart rate, glucose), also body weight needs regular monitoring. Integration of Linkwatch in the CAMI platform will offer additional functionalities such as reminders and alerts. Figure 3 is presenting the interaction of the users with the dynamic program management module which issues medication reminders.

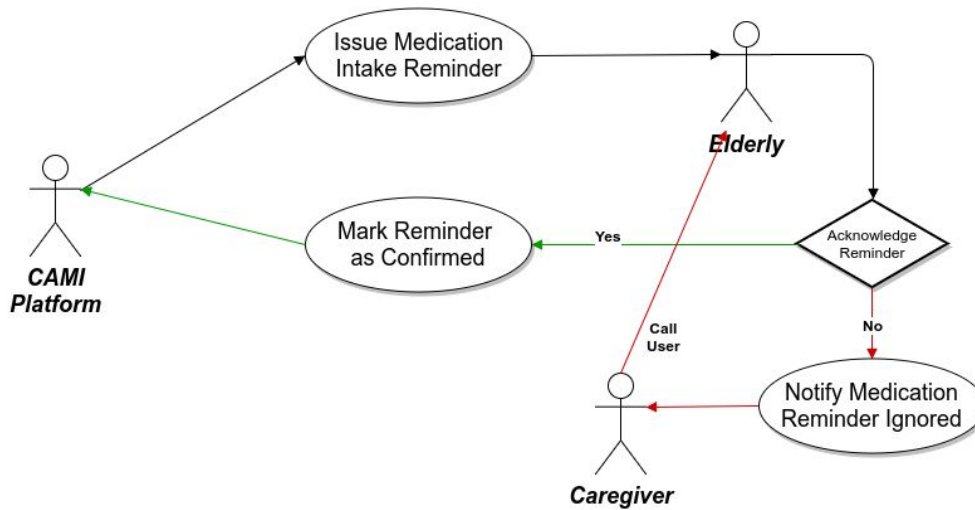


Figure 3. Interaction diagram for the medication reminders.

4.1.3 House hold related end-user group

4.1.3.1 Description of the end-user group

Areas of functioning characterizing end-users in this group are related to house-hold activities. As all surveys clearly demonstrate, people (not only seniors but all adults no matter what their limitations or needs) are determined to keep the most possible level of self-sufficiency and independence in their daily lives. House-hold chores belong to this area in which assistance is mostly needed or early desired but not always available. The matter of non-availability of assistance is strongly correlated with the problem of feeling safe. Respondents in D1.2 (multinational survey) declare however they have a person to rely on in emergency cases. One of the main foreseen outcomes of using the CAMI platform is for its users to feel secure/safe. The home monitoring and automation module in CAMI can be used to guarantee the safe closure of all windows, doors as well as deactivation of electronic devices (electronic cooker, iron, etc.). At the same time, the intelligent home appliances can aid in house hold chores such as vacuuming, windows cleaning, lawn mower, etc. A robotic presence can ensure a smooth (e.g. vocal) interaction between all sensors and devices in the users home and the users themselves.

According to the results of the conjoint analysis, home directed functionalities were ranked by 57 users (25 Romanians, 12 Danish and 20 Polish) among the most preferred ones along with health monitoring and supervised exercises. Moreover, primary end-users in the multinational survey declared to be more interested in purchasing the sensors and devices for home rather than renting them.

4.1.3.2 Diagrams of use-cases

A series of use-cases have been developed in D1.4 by taking into account the interaction between the end-users in this group and the CAMI platform. For example, the diagram in Figure 4 (see D1.4) is presenting the interaction of end-users with the home automation in CAMI.

Additionally, the first integration of a robotic platform (Tiago by Pal Robotics) in the CAMI platform is being planned to be implemented through the home automation module which will relay on the

OpenHAB software. OpenHAB is a highly modular opens source solution which is integrating different home automation systems and technologies and offering intuitive user interfaces. It also offers a [iot-bridge](http://wiki.ros.org/iot_bridge)¹ which can enable the communication between the robotic platform and the home automation devices and sensors.

The `iot_bridge` provides a bi-directional bridge between ROS and the OpenHAB Home Automation system. This allows a ROS robot to connect to a vast variety of IoT devices such as motion detectors, Z-Wave devices, lighting, door locks.

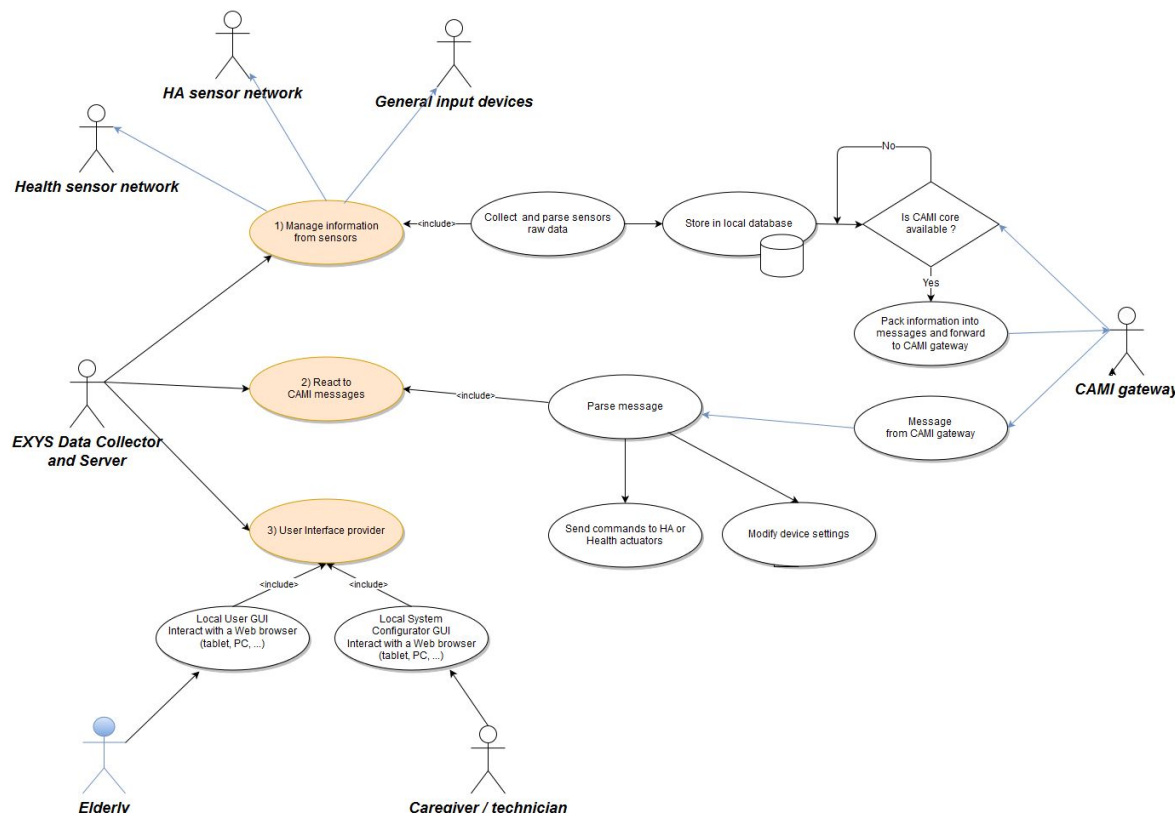


Figure 4. General UML diagram of the interaction between end-users and CAMI home monitoring and automation.

4.1.4 Hobbies and leisure related

4.1.4.1 Description of the end-user group

The end-users in this group (a) have expressed their interest for increased participation in hobby activities; (b) have an interest to have an active social network; (c) have characteristics that affect their daily life including their potential hobbies and/or leisure time respectively. The characteristics concern their body functions, their body structures, their activities and participation to various hobbies and social activities. An active social life proved to be of interest to the majority of CAMI’s interviewed primary users in D1.2. Out of all respondents in the multinational survey 99% expressed their need for socialization (Figure 5). More than half of them (64%) need to socialize often and 8% even need to socialize all the time. Only 27% of the respondents feel the need to socialize seldom. Respondents who do not need to socialize amount to only 1%.

¹ http://wiki.ros.org/iot_bridge

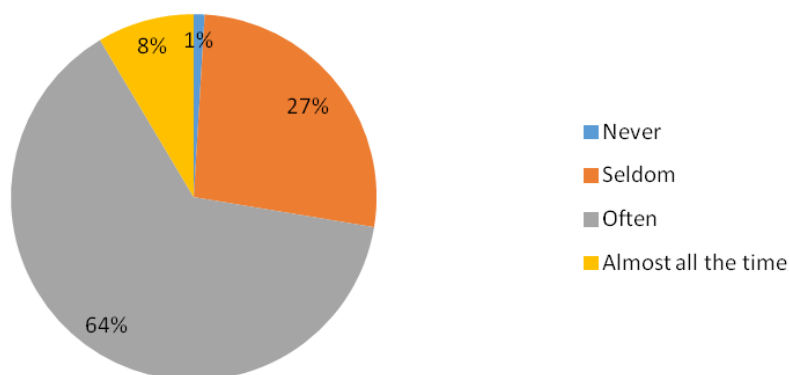


Figure 5. Need to socialize expressed by the respondents of the multinational survey in D1.2

End-users in this group are expected to benefit from the use of the CAMI platform, especially through services such as reminders of appointments, multi-user supervised exercises and telepresence platforms. Additionally, CAMI end-users will also benefit indirectly by being able to engage in their preferred hobbies or a more active social life due to the fact that they maintain a better health status and feel more secure to leave their homes due the home monitoring and automation module.

4.1.4.2 Diagrams of use-cases

As outlined in D1.4, the functionality of the robotic platforms in CAMI is to support the communication between primary and secondary users of CAMI but also among primary users. It is also delivering information to the primary users from the other CAMI modules, e.g. daily reminders. In addition, if the telepresence is replaced with a robotic platform (e.g. Tiago or Pepper in Figure 6) then this module can become the interface between the house and the CAMI users in addition to being a valuable help in everyday tasks: as an intelligent and autonomous security agent for the home; as a hub capable of managing the equipment of their connected home for more comfort and economy; as a personal assistant who is issuing reminders and even brings objects from around the house.

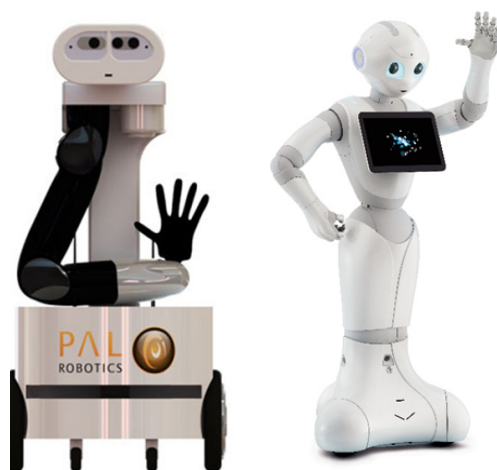


Figure 6. Tiago by Pal Robotics (left) and Pepper by Softbank (right).

The actors interacting with this module are primary users (elderly person) and secondary users (formal and informal caregivers). All actors can initiate the communication, through the telepresence, with other actors. Communication will be accompanied by remote manipulation of the telepresence by the caregiver. Figure 7 is showing the interaction of the users with the telepresence module for communication purposes and also for requesting a demo of physical exercises.

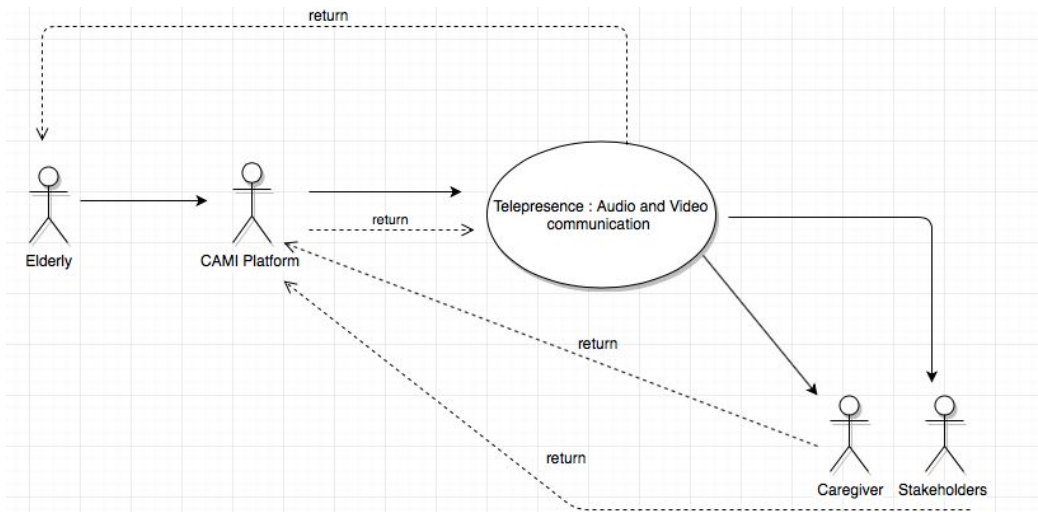


Figure 7. Use case diagram depicting use of telepresence for communication between elderly, caregivers and stakeholders (see D1.4).

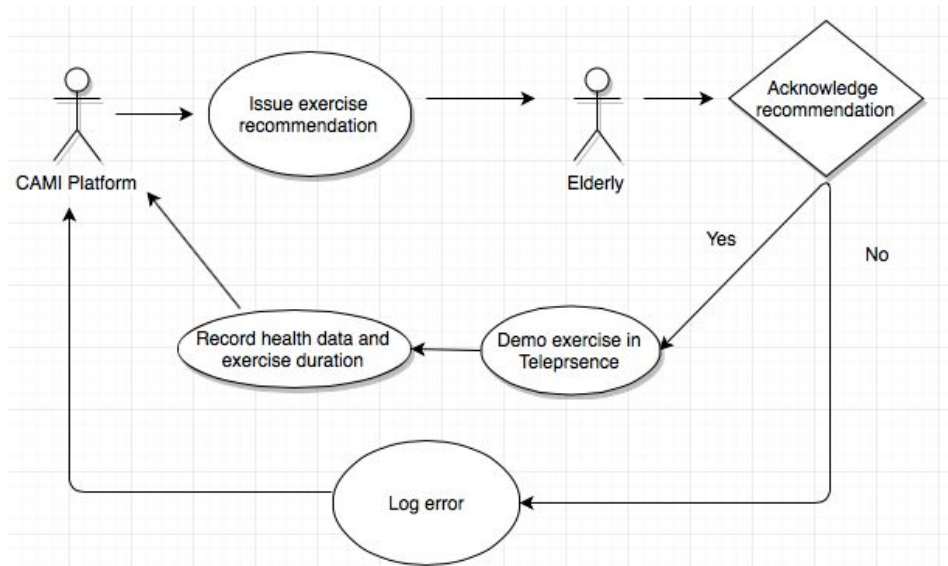


Figure 8. Interaction diagram depicting use of telepresence for supervised physical exercises.

4.2 Secondary end-users classification criteria

CAMI secondary end-users have been defined as being mainly informal caregivers (family, friends, neighbors...). However, we will also consider formal caregivers which will access or use AAL solutions for the benefit of primary end-users. Informal caregivers are any relative, partner, friend or neighbor who has a significant personal relationship with, and provides a broad range of assistance for, an older person or an adult with a chronic or disabling condition. These individuals may be primary or secondary caregivers and live with, or separately from, the person receiving care. Formal caregivers are typically paid providers but they may also be volunteers from a government or nonprofit organization. Where care is being provided in the home there is often a mix of formal and informal care. This happens mostly because with the increasing retirement age, informal caregivers are often still working and thus, the added responsibilities of care often makes it necessary to hire non-medical home care aides to provide supervision and help when the primary caregiver cannot be present. Or as adult day services become more common, caregivers may pay for this form of formal caregiving to get

rest or to allow for maintaining some employment.

When care is no longer possible in the home, then formal caregivers come into play on a full-time basis. This may be in the form of a congregate living arrangement, assisted living, a continuing care retirement community or a nursing home. It is at this point that long term care can have a significant impact on the finances of the care recipient and a healthy spouse living at home.

Another reality of providing informal care services in the home is the increasing need for physical and emotional support that often goes unrecognized until too late. As care needs increase, both in the number of hours required and in the number or intensity of activities requiring help, there is a greater need for the services of formal caregivers.

The need for a caregiver among CAMI primary users has been assessed during the multinational survey (D1.2, see Figure 9). Almost all of the seniors (96%) have a caregiver they can rely on in cases of emergency such as health issues, accidents etc. The survey indicates that a common tendency is to get help and support by close family members (87%). The second popular caregiver type is a friend (46%). The public or private services are the third popular possibility (15%).

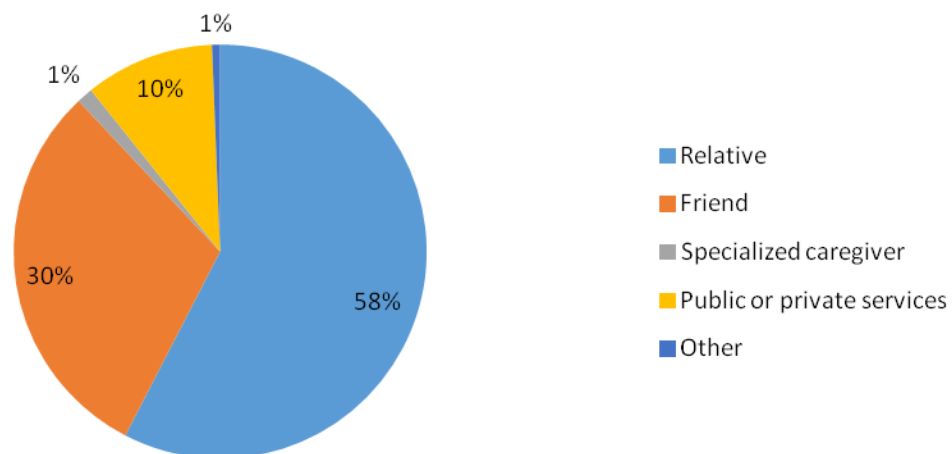


Figure 9. Caregiver type for the end-users in D1.2

All of the caregivers are educated but not necessary as formal caregivers (see Figure 10). Most often it is higher education: 18 of 58 caregivers have a master degree or higher, 26 have post-secondary school. This is most probably due to the fact that most of the caregivers in the survey are informal ones (55%). So, their studies do not reflect their actual training as caregivers. Majority of the secondary users respondents are employed (69%) or retired (16%).

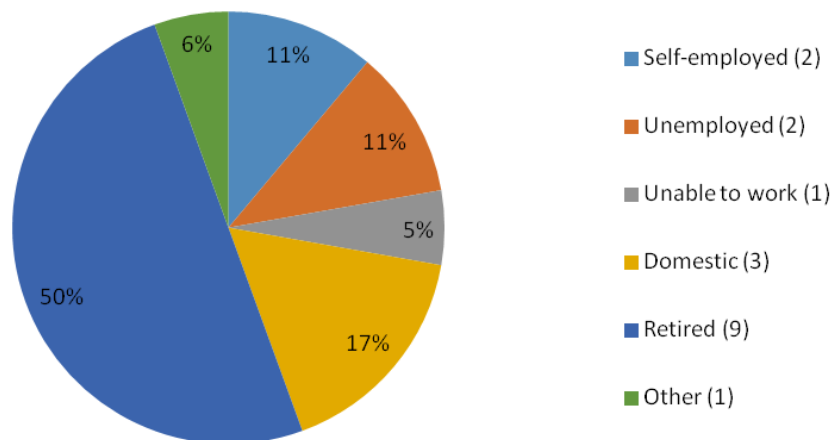


Figure 10. Working status of caregivers in D1.2.

A total of 55% of respondents (32 respondents) declare that persons they have in care are their family members, friends or neighbors, while 45% (26 respondents) of them work as a professional caregiver. Most caregivers work in a retirement home (48%), while the 40% of the professional caregivers work in public institution but in the home of the person in care. Nearly 83% of the respondents think that collaboration with others is very important for their work.

The respondents seem to be highly engaged in their work. Most of the respondents work as a caregiver every day (60%) or almost every day (23%). Only one respondent declared to work as a caregiver only once a month.

Half of the respondents declare to live in the same house with the person they have in care (50%). The other half (50%) live in other places. Among respondents the majority (75%) is working as caregivers in urban areas, this outcome confirms also the information from the primary user research where majority of the respondents live in the urban neighborhood. Some 12% of the caregivers work in rural and 12% work in sub-urban locations.

The experience of respondents as caregivers varies between 1 and 38 years. Most frequent experience is 5 years of experience (6 respondents). 8 of the respondents have worked as a caregivers longer than 30 years.

4.3 Country specific user groups

4.3.1 Denmark

To be completed after reconfiguration

4.3.2 Romania

To be completed after reconfiguration

4.3.3 Poland

To be completed after reconfiguration

5 Conclusions

To be completed after reconfiguration