# Selection of the technologies

## "HO.USING. CA.RE."
USING REframed Skills in Senior HOusing Care
(2021-1-IT01-KA220 VET-000032949)

# A1.1 (a)

TECHNOLOGY AT THE
SERVICE OF PEOPLE



Erasmus+



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# 3.  Introduction

## 3.1.  Introduction

The increase in the average life expectancy above 80 years and the decrease in the birth rate have caused a radical change in recent decades in the population pyramid of the countries of the European Union. This phenomenon has led to a sharp increase in the percentage of people over 65 years of age, reaching almost 20% of the total European population.

In addition, the diversity of family models and other current socio-economic factors results on more and more elderly people living in independent or collective homes far from other members of their family. These factors suppose a lack of accompaniment and moral and physical support for the elderly, which directly translates into a greater deterioration of their cognitive, affective and physical functions.

In parallel with the aforementioned population and social change, the digital revolution has caused many people, especially the elderly, to have difficulties adapting to a new way of life in which technology is important to carry out daily activities. We have digitalized communications or procedures among other activities and this translates into the so-called digital divide that makes these people, feeling far from technology and feel somewhat disconnected from today's society. In contrast to this situation, opportunities are opening up for different technological solutions designed specifically for this group to tackle some of the daily problems that older people face.

For common situations that affect the elderly such as loneliness and isolation, chronic boredom, sedentary lifestyle, poor eating habits, cognitive and physical deterioration or lack of adherence to the medication treatment, technology in its different forms of implementation has the capacity to offer innovative solutions to solve them.

Usable and accessible technology adapted to the experience of these users is capable of meeting the challenges of active and healthy ageing, improving autonomy, empowerment, improving interpersonal relationships, adherence to the medication or emotional support.

Likewise, there are a series of very useful tools for formal and informal caregivers to improve information and training, emotional support or improve efficiency in their daily tasks, among other aspects.

Professionals in the field of care can, in turn, be prescribers of technological solutions for the elderly and their families if they have the appropriate information and training.

This document will present a map of the technologies available both to improve the care of the older people and to be used by them and their families to meet their various needs.

## 3.2.    Goals

1. Classify the types of technologies related to active aging of the older people and support for caregivers within the framework of ICT and accessibility.
2. Describe the general lines of this type of technology and its trends

3. Present information on a selection of technologies that could be relevant to the European project HO.USING . CA.RE.( USING REframed Skills in Senior Housing CAre ") Erasmus+ 2021 – KA2 Cooperation Partnership ).

## 3.3.    Scope

This document will address the objectives set out in the previous section from the perspective of the TECSOS Foundation and its shared experience with the rest of the project participants.

TECSOS will be able to provide an analysis of the best-known technologies that are close to its activities, especially in the field of telecare, products and services aimed at the elderly and also on accessibility.

This document is written in a first phase of exploration and selection of technologies that must be interesting and have the possibility of being considered for the HOUSING CARE Project. Therefore, it contains interactive information about the technologies in a precise way, but in a general scope, that is, this document is not intended to be an exhaustive guide or manual for the use of the selected technologies.

Many links and references have been included within the text information so it can be easily accessed and expanded as needed making this document an interactive source of information. It is intended to be this way so it is possible to deep dive into the information but without bulking all the information that is presented in many other and more suitable ways outside this document.

This selection of technologies intents to be a palette or toolbox available for caregivers to, according to their needs and depending on the situation, be prescribers of technology or in some cases also consumers of it. Therefore, this document will not try to delve down to such a low level as a user guide or configuration manual, and so on, but a broader and less technical descriptive perspective of the solutions.

# 4. Key concepts

- **Active aging:** Active aging applies to both individuals and population groups. It allows people to realize their potential for physical, social, and mental well being throughout the life course and to participate in society according to their needs, desires and capacities, while providing them with adequate protection, security and care when they require assistance. [1]

- **Augmentative and alternative communication (AAC):** is an area of clinical practice that supplements or compensates for impairments in speech-language production and/or comprehension, including spoken and written modes of communication. AAC falls under the broader umbrella of assistive technology, or the use of any equipment, tool, or strategy to improve functional daily living.
  AAC uses a variety of techniques and tools to help the individual express thoughts, wants and needs, feelings, and ideas.
  AAC is **augmentative** when used to supplement existing speech, **alternative** when used in place of speech that is absent or not functional, or temporary as when used by patients postoperatively in intensive care. [2]

- **Dependence:** The permanent state in which people find themselves who, for reasons derived from age, illness or disability, and linked to the lack or loss of physical, mental, intellectual or sensory autonomy, require care oor help from other people to carry out basic activities of daily living. [3]

- **Digital divide:** The disparity in accessing to the technologies and resources of the information and communication. The digitalization of the economy and the society may produce differences and gaps amongst individuals, households, businesses, and geographic areas. [4]

- **E-health:** WHO defines e-Health as the cost-effective and secure use of information and communication technologies (ICT) in support of health and health-related fields. It encompasses multiple interventions, including telehealth, telemedicine, mobile health (mHealth), electronic medical or health records (eMR/eHR), big data, wearables, and even artificial intelligence. [5]
  The European commission defines e-Health as the use of ICT in health products, services and processes combined with organisational change in healthcare systems and new skills, in order to improve health of citizens, efficiency and productivity in healthcare delivery, and the economic and social value of health. eHealth covers the interaction between patients and health-service providers, institution-to-institution transmission of data, or peer-to-peer communication between patients and/or health professionals. [6]

- **Non-professional care:** Care provided to people in a situation of dependency at home, by members of the family or their environment, not linked to a professional care service. [3]

- **Personal autonomy:** The ability to control, face and make, on one's own initiative, personal decisions about how-to live-in accordance with one's own norms and preferences, as well as to carry out the basic activities of daily life. [3]

- **Personal health records (PHRs):** A PHR is a computerized health record created and maintained by an individual who is proactive in the management of her or his own health. The record can be private, or made available to health-care providers. PHRs can store a diverse range of information such as an individual's allergies, adverse drug reactions, chronic diseases, family history, illnesses and hospitalizations, medications, diet and exercise plans, and test results. [7]

- **Professional care:** that provided by a public institution or entity, for-profit and non-profit, or self-employed professional whose purposes include the provision of services to people in situations of dependency, whether at home or in a center. [3]

- **Smart device:** Is an electronic device, generally connected to other devices or networks via different wireless protocols such as Bluetooth, Zigbee, NFC, Wi-Fi, LiFi, 5G, etc., that can operate to some extent interactively and autonomously. [8]

- **Augmentative and alternative communication (AAC):** is an area of clinical practice that supplements or compensates for impairments in speech-language production and/or comprehension, including spoken and written modes of communication. AAC falls under the broader umbrella of assistive technology, or the use of any equipment, tool, or strategy to improve functional daily living.
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# 5. Classification

In order to cover all types of technologies that may be useful both for the elderly and for caregivers, it was decided to make the following division into categories and subcategories splitted into 3 key groups: Accessibility, Efficiency and Well-being of Carers and Active and Healthy Ageing.
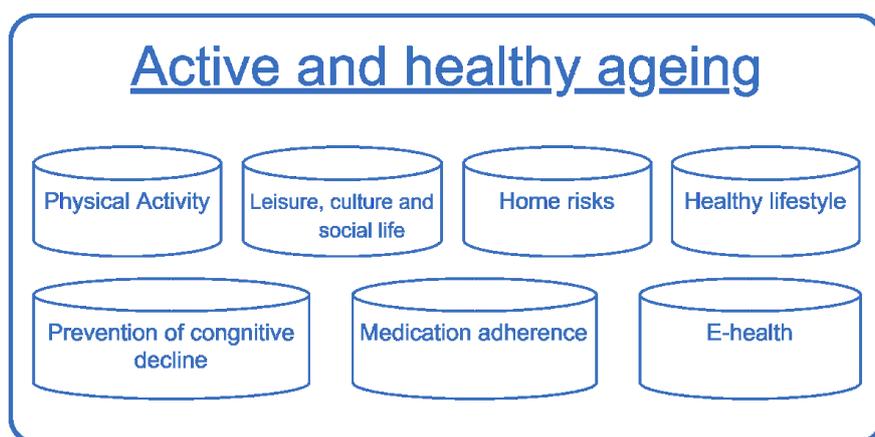


*Figure 1 Active and healthy ageing level 1 categorization*



*Figure 2 Efficiency and well being of care workers level 1 categorization*
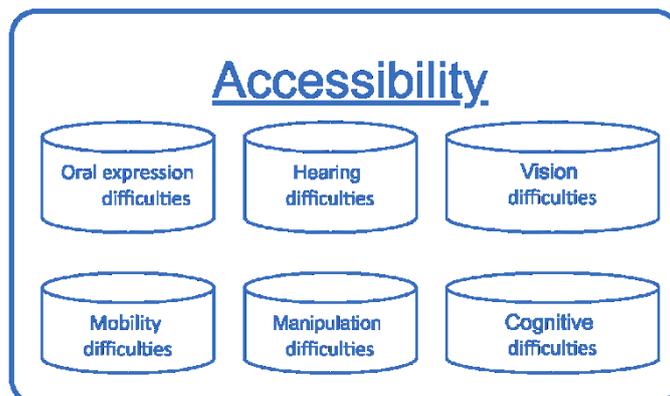


*Figure 3 Accessibility level 1 categorization*

## 5.1.  Active and healthy aging

a. Physical Activity
    i. Physical maintenance
    ii. Rehabilitation
b. Leisure, culture and life in society
    i. Leisure and culture
    ii. Life in society
c. Home risks
    i. Monitoring
    ii. Emergencies
d. Healthy life habits
    i. Nutrition
    ii. Organization and schedules
    iii. Emotional health
e. Prevention of cognitive decline
    i. Autonomous Cognitive Stimulation activities
    ii. Guided cognitive stimulation activities (remote or personal)
    iii. Others activities
f. Medication adherence
    i. Smart devices
    ii. Reminder and follow-up services or apps
g. Personal autonomy
    i. Communication
    ii. Transport / mobility
    iii. Self -management
h. E-health
    i. MobileHealth
    ii. TeleHealth
    iii. Electronic & personal records
    iv. Decision support systems

## 5.2.    Efficiency and well-being of caregivers:

      i. Training solutions
           i. Training and formation
           ii. Professional scope networks
      j. Emotional support solutions
           i. Emotional support networks
           ii. Emotional management activities
      k. Efficiency and automation of processes
           i. Organization and coordination tools
           ii. Telematic platforms that ease administrative procedures

## 5.3.    Accessibility:

      l. Oral expression difficulties
      m. Vision difficulties
      n. Hearing difficulties
      o. Mobility difficulties
      p. Handling difficulties
      q. Cognitive difficulties

Although this classification covers practically the entire spectrum of needs, it is worth to mention the great difference that currently exists for the user between using products rather than commercial services in terms of their cost, use and interaction with technology. When it comes to costs, services are usually related to subscription methods. opposed to this, there is the option of spending money one time on the product and let it be configured, managed and be used all by one person. Use and interaction wise, services usually prepare and manage the complete environment where the solution will be installed, it takes care of the maintenance of the equipment and sometimes of the communications too, it also could offer human to human interactions thar may not be covered by a product or device.  For this reason, when we deal with each subcategory in other sections, we will make the distinction between products and services.

# 6.  State of the art

## 6.1.  General lines and trends

Nowadays, technologies for the elderly and for the support of caregivers have mainly been influenced by the popularization of smart mobile devices such as smartphones, tablets, smartwatches, smartTVs or wearables, etc... and by the evolution of communication technologies (speed, coverage and price reduction).

Specifically, in the relevant areas to the Project, it could be highlighted the importance of the evolution of telecare, the variety of commercial devices and apps aimed at the elderly.

It is also worth mentioning that the popularization of intercommunication solutions such as social networks, video communication platforms, forums, email management in mobile devices as well as the facilities, if you have the necessary training, to carry out administrative procedures and other day-to-day procedures in a simpler way are changing the way we operate around these evolving technologies.

The innovation trend in these areas ranges from the personalization of products and services tailored to users, through the immediacy of apps that allow access to information from a very wide range of devices, to innovation in connectivity and interoperability of a multitude of technologies along the Internet Of things, being its maximum exponent the smartHome and the smartCities.

To delve deeper into the relevant technologies, the categories will be treated one by one, explaining their current status, general pros and cons if they can be identified, and the trends of recent years to take future technological expectations into account.

Innovation is often marked by the so-called hype curve
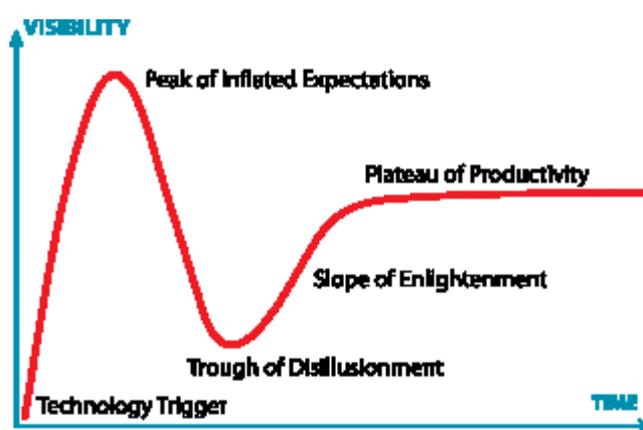


*Figure 4 Gartner hype cycle*

Due to this phenomenon, many technologies that currently may seem quite positive, probable and disruptive, will remain in the disillusionment phase and will not mature. Bearing this in mind, future lines of research and innovation must be given controlled expectations

and importance, neither too high nor too low, always bearing in mind that only a very small number of technologies that years ago were considered revolutionaries are currently reaching their maturation phase.

It is for this reason that in the selection of technologies in chapter 4, only technologies with a certain degree of maturity, reliability, robustness and commercialization are presented. This does not mean that the technologies are outdated, many technologies are innovative or the use made of them is a new point of view.

Some of the mentions to innovative and technological solutions will be made through the web portal **Orientatech** [9]**,** developed and maintained by TECSOS. The non-biased reviews that are linked with the products, were made by TECSOS team (technical validations) and sometimes it includes social validatons made by volunteers.

## 6.2.    Active and healthy aging

In this area we can find technologies that try to solve the following aspects:

- Promote the personal autonomy of the elderly and facilitate decent treatment adjusted to the needs of each person.
- Empower and accompany older people in their daily lives to improve their quality of life by staying active, safe and healthy for as long as possible, in the place they decide is most convenient.
- Mitigate the digital divide.
- Mitigate the aggravating effects of COVID-19.

**Active and healthy aging technologies**

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## Current state of the technology

Currently the technology presented on this section is booming, in recent years many new technological products and services have emerged specially oriented to the needs of older people

When working with these technologies, special care and attention must be paid to usability and accessibility, since the profile of the elderly person does not usually have great technological skills and the permeability and motivation to learn in these matters can sometimes be limited. Some solutions are not very friendly for older people and it may be necessary to adapt them or combine them with other tools (Support productsy) so that their adoption is more effective, to this is added the wide range of personal needs that may be required.

This type of technology covers a wide range of solutions, beginning with the conception of current Telecare and Tele alarms, to which a special section will be devoted in this document, together with the most common sensory possibilities.

There are also a large number of different applications, services and products that are generally very specific to solve/mitigate a need, such as "intelligent" reminders or pillboxes, cultural or cognitive stimulation applications, social networks, video call solutions, simple mobiles or easy launchers among others.

Finally, it should also be mentioned that voice assistant technology is beginning to gain importance in the field of personal autonomy for the elderly and may be included in several categories (with different functionalities), since the value it brings to older people has been proven. [10]

Because some of these subcategories are extremely varied and extensive, only a first more general analysis can be included and later, in chapter 4, the selection of technologies will be expanded accordingly.

## Technologies to support physical activities

Two well-differentiated subcategories can be identified in this section: rehabilitation, which includes solutions aimed at physical recovery after some intervention or medical event, and Physical maintenance, which includes solutions related to activities that allow older people to prolong as far as possible good physical health over time.

Some related solutions are:

- Solutions for the presentation of multimedia content of maintenance gymnastics or generic exercises together with video call technologies that connect caregivers with the elderly for remote exercises and for follow-up.

- Initiatives to promote therapeutic and leisure walks can be carried out remotely with video calls and GPS tracking if necessary to provide extra security for older people who have sufficient autonomy, and even to provide extra support, the solution can be used with googleMaps (Augmented Reality).

- Monitoring of basic variables from self-measurements or devices not certified by any medical standard: this section is closely related to E- health, Personal Health Records (PHRs) and healthy habits. In relation to this category, the main objective would be **to promote and assure secure physical activity** in a healthy way with recommendations and the monitoring of these measurements **that should not be taken as medical references because either are not really reliable data or the self-measurements may be incomplete or incorrect**. It can be complemented with follow-up video calls, support or advice from the caregivers.

Some examples of technology are:

- Bracelets or wearables wirelessly connected to a smartphone or similar.



*Figure 5 Examples of fit wearables 1: MiBand 5*



*Figure 6 Examples of fit wearables 2: GalaxyFit 2*

- Pedometers and basic monitoring apps like google fit  , Mifit  or similar.

- Audiovisual guides such as "SerCuidador@" youtube channel guides:



*Figure 7 Video Caption of head/neck exercises video made by SerCuidador@*

(https://youtube.com/playlist?list=PLpAOh0zTr4QkXQegcrHINdoMAggQP8v7m)

- Physical encouragement, and social connecting apps such as Rosita:
  Rosita is an application aimed at people over 60 years of age that proposes personalized exercises, physical activities or nutrition classes among other activities, with the aim that people over that age group can lead an active, healthy and healthy life.
  ([https://www.orientatech.es/en/rosita](https://www.orientatech.es/en/rosita))



*Figure 8 Example of Rosita app from Google Play Store:*
*https://play.google.com/store/apps/details?id=com.heartsradiant.rosita&hl=en&gl=US*

- Physical maintenance and cognitive exercises through Virtual Reallity and static pedals

([https://orientatech.es/en/oroi](https://orientatech.es/en/oroi))
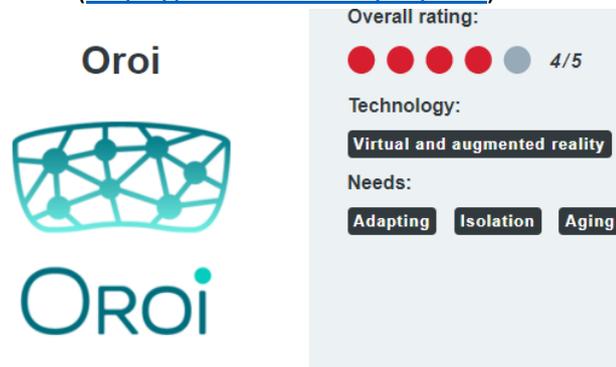


*Figure 9 Oroi VR solution Review by TECSOS in Orientatech.es*

It is a collection of interactive videos through which users can enjoy bicycle rides through different environments, whether real or in 3D. It consists of a system that combines the use of pedals with virtual reality glasses, in a way that favors physical exercise.

The solution uses Pico VR devices and the connection to the pedals to measure speed and accommodate the video movement is made through Bluetooth.

More info: ([https://www.oroi.info/fit](https://www.oroi.info/fit))

## Tools for leisure, culture and social life

This category includes technologies that promote cultural and leisure activities of the elderly and the mitigation or prevention of social isolation, it is desirable that they can be adapted to personal tastes and needs.

Virtual assistants deserve a special mention as they can allow the adoption of other technologies in an easy, accessible, usable and attractive way. This is possible thanks to the natural language control interface and in some cases have the possibility of presenting audiovisual content or make video calls.

Some technologies in this section are:

- Social networks and or instant messaging apps such as Facebook, WhatsApp, Telegram, as a method to stay in touch with family, friends from the past or meet new people with common affinities or interests.

- Museum apps, virtual tours, informative or audiobooks among others.

    o https://sagradafamilia.org/es/visita-virtual (Virtual tour):
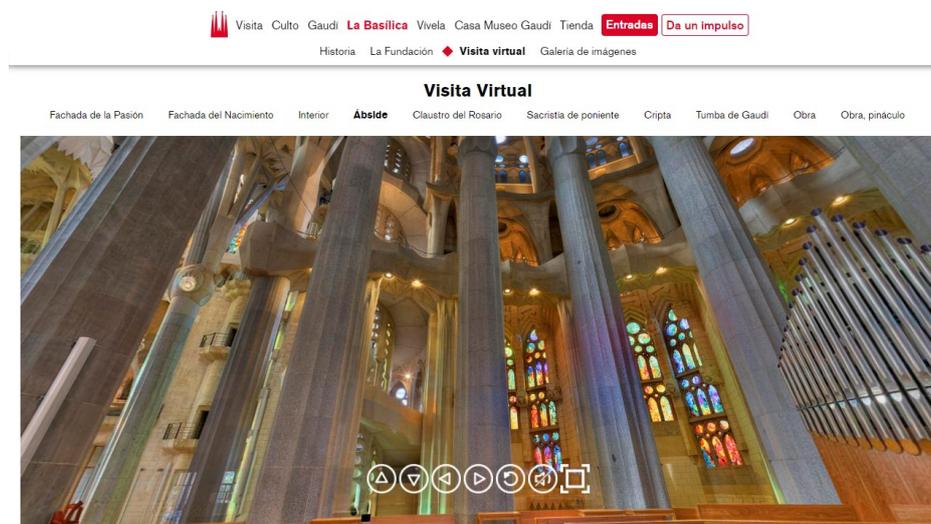


*Figure 10 Sagrada Familia Virtual tour*

    o Audible (audiobooks app): (https://play.google.com/store/apps/details?id=com.audible.application&hl=en_419&gl=US)

    o LibriVox: (https://librivox.org/)

*Figure 11 LibriVox Free public domain audiobooks*

- Video call solutions like WhatsApp, Voice assistants with audiovisual interface (amazon echo show), Zoom videoCalls, specific apps, …

- Voice assistants and conversational applications:

   Voice assistants allow person-machine interaction through the use of natural language thanks to the conversational processing of Artificial Intelligence, currently this field of computing is quite advanced and allows fluid and variable interaction, although it is constantly changing and improving.

   The most common voice assistants are: Alexa (amazon) , Siri (apple) , Google Assistant or Bixby (Samsung) . Virtual assistants will be covered in more depth in Chapter 4 (Voice assistants).

## *Home risk management tools*

This category describes technologies that can make elderly people feel safer and more accompanied. Both the monitoring and the management of emergency situations could be managed from the telecare point of view, which includes the most complete services (monitoring environment and risk detection, care and monitoring personnel and robust infrastructure certified under UNE standards). Although there are also tele-alarm services, accompaniment (outside and inside the home), independent sensors (personal monitoring environment, normally closely related to IoT) and other solutions.

As the topic of telecare is very complex and relevant to the project, it will be covered in more detail in Chapter 4, Technology Selection.

Although accessibility it is important in general terms, specifically in this category, it is especially important as the lack of it can affect in a greater scale, the safety of the elderly people.

Some examples of these technologies are:

- Home Environment Sensors:
  This type of sensors can be divided into two large subcategories, the sensors that are installed in people's homes and the devices that people must carry with them at all times, since they are devices mounted on accessories and are based on the premise of being always near to the person. Among these devices are:

  o Watches and trigger-buttons (bracelets, pendant, etc …) that, in addition to the alert functionality by explicit request, may have some type of extra sensor or fall alert. Fall detectors are not fully mature yet, as they generally trigger many false positives and sometimes false negatives due to the great diversity and casuistry of falls in the elderly.
  One of the biggest problems with these devices is the need to wear them at all times, older people do not always carry them, they can forget about them or take them off in the shower for example (although they are waterproof)

  o Home sensors such as smoke, gas, flood, theft, presence or opening door detectors.
  Normally, if these sensors do not have any associated service, they usually send an alert (call, SMS, etc …) to the predefined emergency contacts, sometimes the system can notify the authorities.

- Remote accompaniment: it can be more traditional through telephone calls, although the advantages of carrying out follow-ups calls through video communication platforms are obvious. Some examples are, Whatsapp, or for example the video attention program of the Spanish Red Cross, which through a specific platform of the organization, has been monitoring users for many years and providing a remote cognitive stimulation service.

- Monitoring and alert apps: these types of applications usually share a common pattern of functionalities, so due to their wide variety of interfaces, accessibility or usability features, there is no universally better option. These applications are usually focused on sharing locations in a controlled and safe way with the chosen contacts (sometimes with the authorities) and usually allow you to send some more or less specific alert, depending on the app.

- Telealarm and Teleassistance: services that provide a device-monitoring environment inside or outside people's homes with human backup in case it is required.

As the last point about teleassistance and telealarm is more complex, it will be addressed in more depth below in chapter 4.


## Healthy lifestyle


This category includes technologies that promote a healthy lifestyle, mainly around nutrition, organization and monitoring of habits and activities or emotional health, among others.

This category is closely linked to the PHRs (personal health records) eHealth section, since it is a good practice for people to keep their own health record, it can be more or less accurate or be more or less automated. It should be taken into account that in case that the elderly person wants to share the previously mentioned PHRs with the caregiver, it is recommended to review the legal indications of the territory in and if there is a need or not of signing a document of conformity.

Some examples of these technologies are:

• Wearables for monitoring habits (activity, steps, sleep, ...) and constants (beat rate, wheigh): this type of device is usually integrated with a mobile application to access, share or export the recorded historical data, reminders or notifications can also be programmed on some devices to help the person follow healthy routines or habits. The best-known devices of this type are smart watches/bracelets from Apple, Xiaomi, Samsung or Fitbit. There are pedometer and similar applications for IOS or Android too.
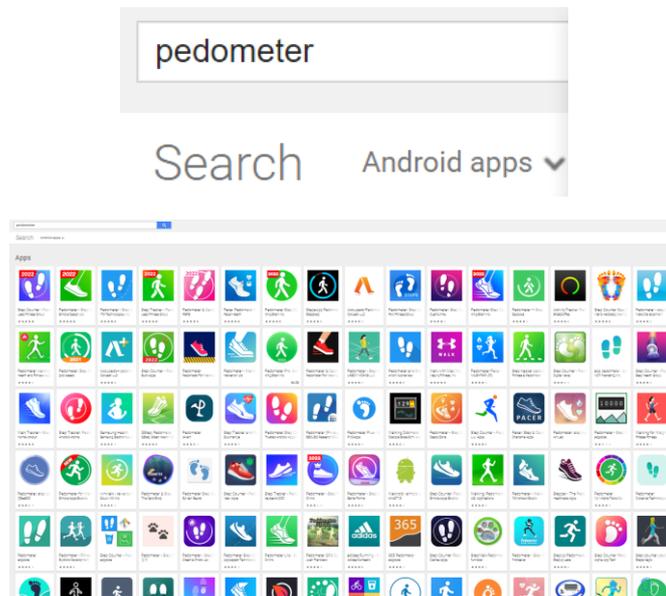
*Figure 12 Pedometer search in google's app store*

([https://www.orientatech.es/en/beprevent](https://www.orientatech.es/en/beprevent))
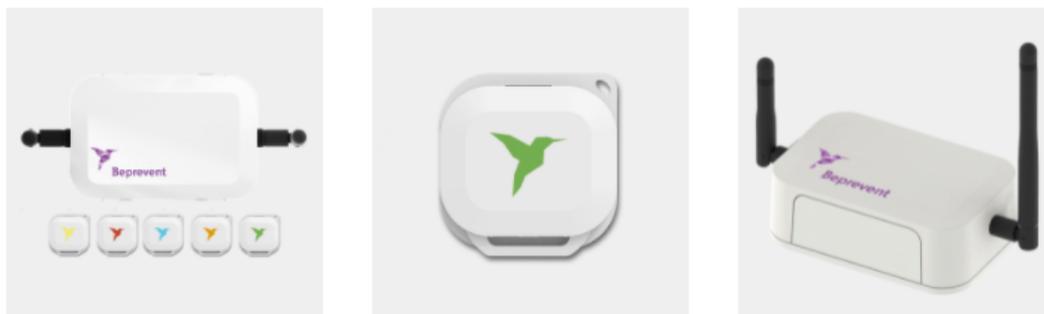


*Figure 13 Beprevent smart tags solution for habit monitoring at home*

- Apps for recipes and healthy food and meal planning, cooking video content, improving life habits such as reading, sleeping or relaxation, or emotional health management, among others.

  In case the applications are compatible with screen devices and voice assistants, they are generally more usable and accessible. The voice assistant can guide the elderly person through natural language and audiovisual stimuli through recipes, meditation sessions, etc... to achieve greater experiences.

Yuka App ([https://www.orientatech.es/en/aplicacion-yuka](https://www.orientatech.es/en/aplicacion-yuka))

Yuka is an application for Smartphone that scans food and cosmetic products and offers information on their composition and evaluates their effects on health.



*Figure 14 Yuka app caption*

- The daily routines that can be configured with voice assistants are an exceptionally customizable tool that allow you to adjust a series of interactions to be carried out for each person based on the time or predefined interactions (good morning, good night, etc…). These actions can range from playing news report, weather information, notifications or messages to running applications, turning on lights, raising blinds or more complex actions.

- Apps to promote healthy activities and family/group activities: there are applications aimed at carrying out activities and monitoring them. Video communication technologies can also be a good tool to promote these activities and personal care (virtual meals, reading meetings, etc...).

- Personal management apps: these applications usually facilitate the follow-up or assistance of other people such as family members or caregivers, among the most important there are endless applications for reminders, scheduling, tracking dates or relevant events.

## Prevent cognitive decline

This category presents the technologies that support or provide solutions so that the elderly can carry out cognitive stimulation activities both autonomously and guided with the aim of preventing or slowing down the possible cognitive deterioration that the person may suffer.

Because cognitive stimulation activities can be very different and sometimes it is recommended that the activities have contents adjusted to the person they are addressed to (the need to remember dates, names, relevant events, definitions, accessibility, etc...), the solutions are equally varied and different from each other.

Among all the solutions, here are some that illustrate the main branches:

- Applications based on or that include video communication capabilities: these solutions are aimed at carrying out guided activities with a greater or lesser level of interactivity so that the caregiver or person in charge of cognitive stimulation can connect with the elderly person and monitor the activities of cognitive stimulation. An example of these solutions is the Spanish Red Cross "video care" initiative, which has been in operation for many years and perfectly illustrates this category. Specifically, this project adapts the television in the elderly person's home so that from there, in a known environment and interface, they can carry out a connection with the Red Cross staff who conduct activities and follow-up.



*Figure 15 Elderly point of view of "videoatención" Spanish Red Cross*



*Figure 16 Elderly point of view (closer) of "videoatención" Spanish Red Cross*

This category also includes the simplest typical video call solutions that, as a result of the COVID-19 pandemic crisis, have been an alternative to face-to-face cognitive stimulation activities.

- Apps that generally run on mobile devices or even on devices with a screen and virtual assistants that can be used autonomously by the person in question:
    - Cognitive stimulation activities (extended in section 4, Lumosity):

**Lumosity** (https://www.orientatech.es/en/Lumosity)

Lumosity is a brain exercise or cognitive stimulation application that allows you to train memory and mental agility, which can be especially useful for the elderly. This application consists of a series of games and tests that will exercise the different areas of the brain.

**Neuronation** (https://www.orientatech.es/en/Neuronation)

Neuronation is a brain stimulation application that aims to improve cognitive activities and processes, which can be especially useful for the elderly. It is developed by neuroscientists and is based on 23 categories with various memory and concentration games that adapt to the evolution of the person who handles it.

**Cognifit** (https://www.orientatech.es/en/cognifit)

Cognifit is a brain fitness and cognitive stimulation app that allows you to assess and train your memory and mental agility. It stimulates the user's cognitive abilities with mental challenges, thinking games, puzzles, brain teasers, and educational games.

**Memorado** ( https://www.orientatech.es/en/memorado)

Memorado is a brain gymnastics or cognitive stimulation application that allows you to train memory and mental agility. This app consists of a series of games and tests that will exercise the different areas of the brain. In addition to these games the application also provides a series of audio sessions that can help users to calm their mind.

o There are other solutions such as Mobile tele care with the possibility to define safe GPS zones (the alarm is triggered if the person goes outside the safe area).

o Memory banks for people with advanced dementia or Alzheimer's. Many applications that are designed for the elderly allow you to save multimedia content (video, photo, audio, text, GPS location, etc...) to be able to consult them later, other applications try to find a relationship between the experiences of the person in question and contents audiences of the time or related field.

An example of each type is illustrated below:

▪ Vital soundtrack: tries to find relations between the person and the music that was popular at the time in an attempt to connect with his memories of the past.
https://orientatech.es/banda-sonora-vital
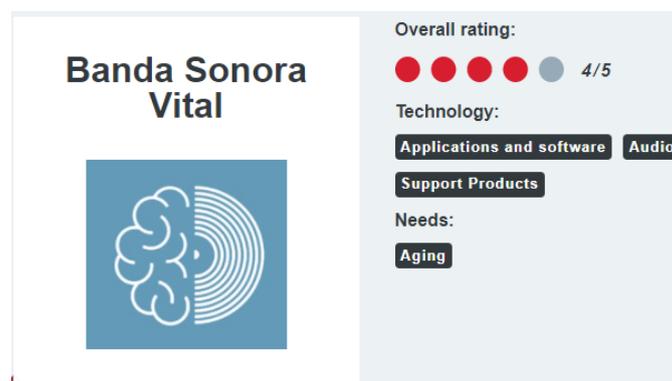
*Figure 17 Vital SoundTrack Review by TECSOS in Orientatech.es*

- Family search: example of a traditional memory bank app.

([https://play.google.com/store/apps/details?id=org.familysearch.mobile.memories&hl=en&gl=US](https://play.google.com/store/apps/details?id=org.familysearch.mobile.memories&hl=en&gl=US))
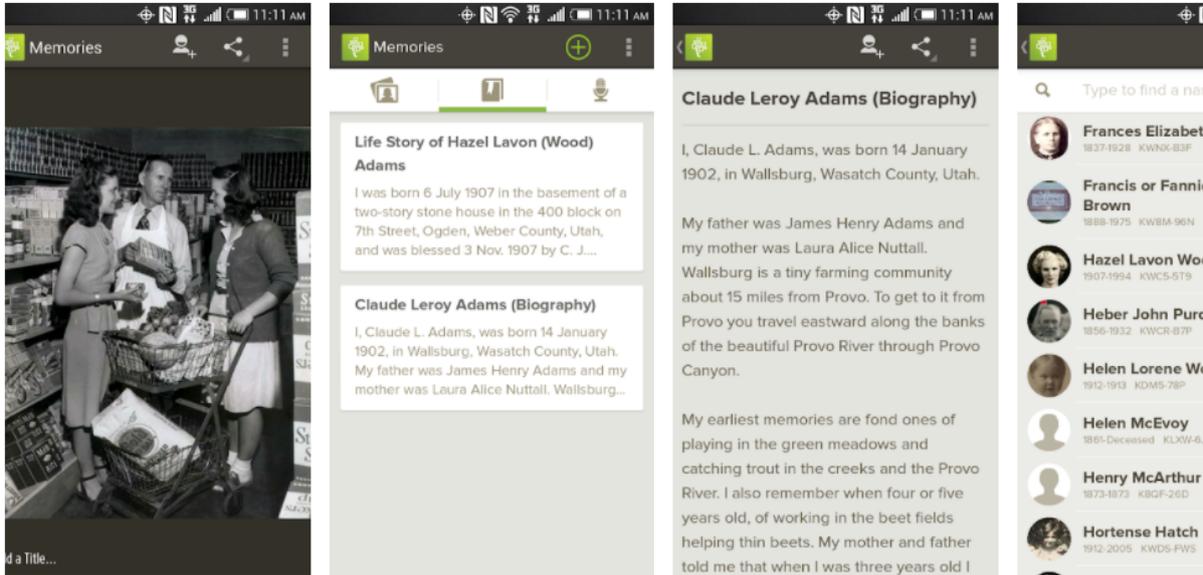


*Figure 18 Example of a memory bank app ("family search")*

## *Medication adherence*

Medication adherence in elderly people is a well-identified problem, especially in polymedicated people. This category deals with solutions that try to improve that medication adherence by using specific devices, services or applications as shown below:

- Apps: these applications are very varied and are usually simple applications with very few marked functionalities, ideally they would have a simple interface to improve usability. Most applications that are free or have a free version include the option to add reminders and create some type of file for each medication to illustrate to the elderly person or caregiver what should be administered at all times.
   The most complete applications sometimes allow a differentiation of two types of users, a user who configures and tracks medication intakes (and can be notified when said intake is skipped), and a user who only receives medication alerts and must confirm in the application that the correct one has been taken. In some cases, the application even becomes a kind of PHR, grouping monitoring of medication intake, blood pressure measurements, weight, and others, in addition to monitoring the mood of the elderly person, with the option of sharing it safely with family members and doctors in an organized way.

Some examples that are extended on section 4 and can be consulted in depth from the Orientatech website are:

**("ctrl+click" the image to open link on the web browser or visit orientatech.es/en)**
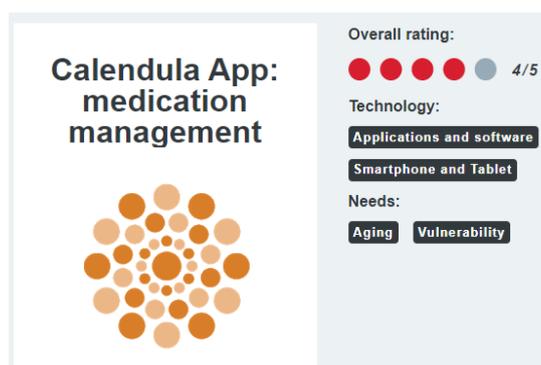


*Figure 19 Calendula Drug follow-up tool*

*Figure 20 Medisafe Drug follow-up and PHR tool*
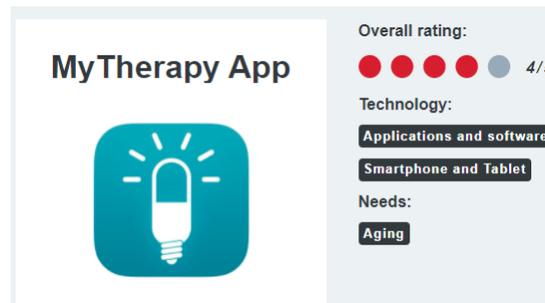


*Figure 21 MyTherapy Drug follow-up and PHR tool*
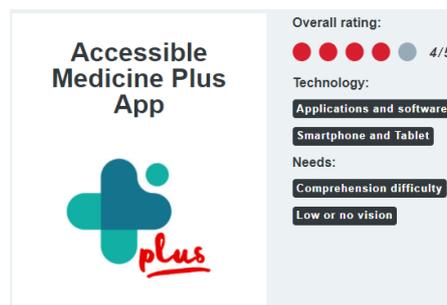


*Figure 22 Accesible medicine plus App, App for people with null or reduced vision (only Spanish)*

- **Devices:** these devices most of the time consist of wearables that issue and manage alerts or smart pillboxes with different degrees of automation or control, from a conventional pillbox with a built-in audio alarm system, to a pillbox with alarms and that opens the "cells" where the medication is automatically stored, it is tracked with an app and it can send notifications to relatives or caregivers if necessary.

As extra information, there are advanced automatic dispensing systems with voice recognition, RFID, exhaustive control over the actions and medication taken, the possibility of a video call with a caregiver if necessary, etc... It must be taken into account that the more complex a solution is more chances of errors, learning difficulty and greater resistance to adoption can cause in people.

Very expensive and complex solutions have been mentioned in order to make the possibilities of current technology known, but not with the recommendation of its use.

- **Services:** There are medication intake reminder services via telephone call for people who require such communications with a human operator, the conditions vary according to the different companies and modalities. Sometimes it may be included in some advanced telecare modalities.

## *Personal autonomy*

This category is focused on improving and supporting personal autonomy, facilitating the use and providing tools to empower people so that they can carry out or continue carrying out the tasks and actions that add value to each one in a more independent way.

The most common technologies in this field are:

- **Adapted communication systems:** can be physically or digitally adapted. If the physical interface was designed for the elderly, there are solutions such as: Swiss Voice or Doro phones. Otherwise, if the digital interface was the one to be adapted, there are a large number of easy launchers compatible applications with IOS and Android devices. Both adaptations could be implemented in the same terminal (if they are compatible with each other).

  o Swiss Voice D28: The Swissvoice D28 model is a phone designed for the elderly that stands out for its simplicity. This simplicity is achieved with the addition of large keys, a charging base, voice key reading and simple menus. In addition, it has FM radio.



*Figure 23 Swiss Voice D28 phone caption 1*

*Figure 24 Swiss Voice D28 phone caption 2*

o Doro Liberto 820 mini: Doro Liberto 820 mini is a touch screen Smartphone with menus adapted to the needs of the elderly. It has an Android operating system.



*Figure 25 Doro liberto 820 mini phone caption 1*



*Figure 26 Doro liberto 820 mini phone caption 2*

- **Telecare:** due to the insecurity or fear that certain people feel, it is often found that these people reduce their activity in certain aspects of life or stop doing many activities that they did before a fall for example.
For these reasons, telecare services are often a technology at the service of people's autonomy, they give them the security that if something happens to them they will be

fine. After the installation of the service the activity goes back up or normalizes in some cases.

- There are mobile applications that allow you to carry out administrative, banking or medical procedures that would allow some more technologically savvy people to carry out their procedures electronically and could consult, for example, the date of the next medical appointment or the results of the last blood test. antigens or PCR.
There are countless examples, but each case is different and each person will need the application of a different institution or bank or of their specific reference health center.

    The above solutions could also be combined with video communication technologies or remote access devices to digitally guide and accompany people in their consultations and procedures, even if said procedures are not telematic.

- **Voice assistants:** they are a wonderful tool to promote and improve personal autonomy, since with very little technological knowledge and through voice, older people or caregivers can make queries adapted to their needs. The consultations for personal organization stand out, such as transport consultations, schedules and routes, reminders, calendar, alarms, video calls and others.

- **Transport solutions:** there are applications that facilitate transport planning such as Google maps or specific public transport applications, but there are also applications to request private transport such as a taxis or other vehicles with similar features, telematic payment applications, reservation and consultation of digital tickets, etc.

## E-health

There are many definitions of e-health, some very restrictive that limit its action to telemedicine and only to services related to the medical concept of health and the relationship of ICT with medical professionals [5], others however focus on people's health and what new technologies can do to improve it in many aspects in a more general way [6].

Following the lines established by the European Commission, the definition would fall within the second case and therefore this category is closely related to the rest of the categories, in a direct or indirect manner, because each of them offers some benefit to the health of people making use of it. ICT and the digital world to a greater or lesser extent, regardless of whether it refers to the elderly, caregivers, relatives, neighbors or others. For this reason, each of the other categories or solutions presented previously will not be mentioned again, avoiding duplication and overextension of the document.

Regarding the purely medical concept of health, we find some solutions such as the following:

- **PHRs and health questionnaires:** this point also includes the technological solutions for PHRs that have been mentioned throughout the document. On the other hand, there would be other forms, specific questionnaires, measurement reports or other data required both by health centers or by caregivers to better manage the health of the elderly (they would fall into the category of electronic health records EHRs). Normally the technologies already mentioned in other categories are used or specific platforms of organizations or administrations are used.

- Kits for basic vital signs measurements (blood pressure, weight, temperature, insulin levels, etc.) it can be complemented with communication systems to connect to caregivers or via advanced telecare or ever with some PHR solutions.



*Figure 27 Examples of basic vital signs measurement devices (neat-group.com)*

- **Secure video communications with health professionals and caregivers:** These communications can take place through specific platforms or applications of an organization or through well-known solutions that ensure and preserve the protection of data as sensitive as medical data.

- **Certified Solutions:** These are measurement, management, or support solutions that may be difficult to use, implement, or monitor due to medical standards, device specifications and complexity, or issues related to data protection in communications and broadcasting controlled information to health professionals. These solutions exist and solve problems such as secure patient monitoring, drug prescription and drug administration or AI-supported decision making, but no examples will be named.

# Innovative technologies and lines of research

In recent years, innovation in issues related to healthy aging has followed several different lines such as:

- Innovation in IoT is already revolutionizing the current situation of the solutions in this section, that is, in a very specific way. For now, IoT technologies are at the beginning of this "revolution" although there are already well-founded expectations and objective data that point to the fact that in the In the coming years, this field will develop very strongly and society will have very powerful IoT solutions at its disposal.

- Apps and devices with a target audience of older people are experiencing great growth in variety, quality and quantity.

- Another line of innovation consists of the digitization of telecare devices and services, in turn, as this field has experienced great growth in recent years in terms of the volume of providers, many variants are beginning to emerge and it is expected that in the future in the coming years, innovative solutions to the problems that this field addresses will appear.

- Innovation in the field of computer visión, image processing or other data through artificial intelligence, has experienced great growth in the last 10 years.

  There is currently much research to estimate the pose of the body or hands by for example, more focused on the framework of the project, there would be lines to maintain people's privacy while detecting risks or dangerous situations in the home, such as fall detection. Currently very immature technology (especially in this area that requires data protection and security legislation)
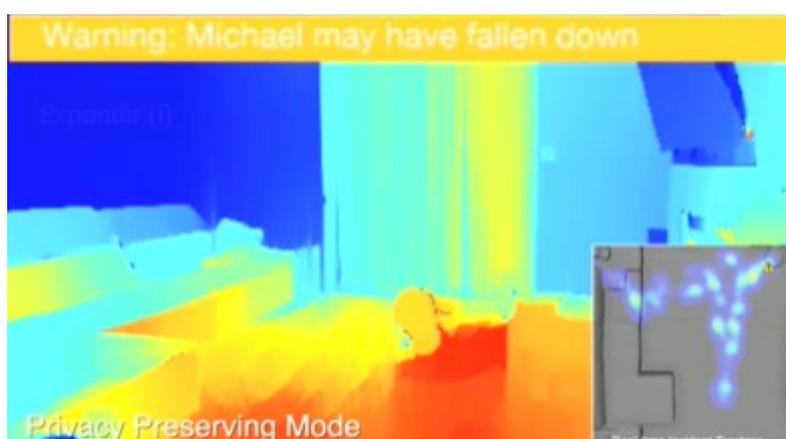


*Figure 28 "Cortic Technology"-powered solution to fall detection [11]*

- On the other hand, there is a line of innovation that is not giving results, although it seems that it has continued to have some weight in research for many years now.

Robotics, which even taking into account the latest developments (in the field of active and healthy aging) has no place beyond a home cleaning assistance activity (not recommended as it involves more risks than benefits).

It is true that, in other areas such as heavy industry or the manufacture of precise devices, transportation or construction, this field has prospered, but it has not been so in everything related to human interaction in the physical aspect, in these areas innovations have been very small.

## 6.3.    Efficiency and well-being of caregivers

In this area we can find technologies that try to solve the following aspects:

- Improve efficiency in day-to-day tasks and more specifically repetitive or administrative tasks of caregivers (a need detected in the OECD report [12])
- Provide a space where careworkers can share their feelings, experiences, knowledge and support each other as a community (managed and moderated). One of the risks for caregivers is burnout.

## Current state of the technology

Currently, the technology related to this point is focused on office automation, social networks (more or less formal) that bring people together and allow data to be shared in a wide variety of formats, as well as resource management and team organization solutions (or on a personal level) and finally, there is a tendency to delegate tasks or actions to solutions that can be automated or semi-automated.

These types of technologies are usually hosted in the cloud or in some cases require a simple installation at most, they also tend to be multiplatform or directly web solutions, which greatly facilitates their access and use in different situations.

One of the most important features of this section is that the most powerful solutions are also the ones that require the most training to use, for example: a simple list application or using WhatsApp hardly requires training compared to that required to handle some program. Excel - type office automation or a more complex and versatile information management app.

Because these subcategories are extremely varied and extensive, we can only include a first more general analysis and later, in chapter 4, "selection of technologies" will be expanded accordingly.

## Communication platforms



This section includes solutions such as:

- Various social networks, web training platforms and platforms that allow Forum-type interactions (managed): These are spaces where people can exchange impressions, information, advice, etc... they usually allow audiovisual content sharing.
  There is a great variety within this group, some solutions are more specific than others in terms of design and purpose, others focus more on unidirectional diffusion vs. bidirectionality of others, etc... it is a well-known section and at the same time very extensive and complex. Some examples are: WhatsApp, Facebook, LinkedIn, Telegram, Twitter, Reddit, specific forums, specialized or massive training platforms such as Edx, khan academy, Skillshare, Brilliant, etc...

- Sharepoint or similar: Specifically, we will treat Sharepoint as an example, it is very relevant because Microsoft services are highly demanded and commonly adopted by organizations.

  It is a Microsoft shared web organizational space that allows a wide variety of integrations with its other services in "small" groups or a communication portal for large groups (many "viewers" in the range of thousands and few content authors).

  It is very versatile, in the option of small groups, it allows you to share files, lists (simple or complex), associate calendars, contacts, accounts, embed content from other websites, widgets of all kinds, and can even be integrated with Teams, powerAutomate or PowerApps.

  In the dissemination-oriented option, it also allows the integration of a wide variety of applications or widgets that can expand the purpose of the site allowing comments, surveys, forms, etc... to seek greater interaction and bidirectionality in the contents of

the site, maintaining security and user authentication (requires account and permissions) and maintaining an organized structure that allows content moderation if necessary.

In both cases, personalized permission management (individual or group) is included for each aspect thereof. To make use of Sharepoint sites, it is necessary to purchase licenses (although in many cases organizations already have these licenses that are shared for other Microsoft solutions).

## *Organization and management tools*



Especially in this section, intuitive multi-platform solutions are more relevant since this can help reduce the technological resistance that has been detected in caregivers and ease of use anywhere. (identified in [12]).

Many of these solutions allow some degree of automation or pre-programming that can reduce or help better manage workloads, although this generally requires advanced knowledge (with the exception of some solutions that allow you to import templates or components that can be created or recommended based on the needs by professionals).

This section includes solutions such as:

- Cloud storage applications: there is a wide range of similar products, the most commonly known being GoogleDrive, OneDrive, DropBox, AWS or Azure (storage) among others.
  They can be very useful as a tool to share or simply save data in the cloud and access it at any time with different devices and applications, it has many uses since there are many applications from other categories that offer integration or are supported by these solutions.

- Sharepoint as a personal, team or project-level management tool, specific administration platforms (each with its own characteristics) that allow work or administrative

procedures to be carried out electronically, the latter being important, but probably very dependent on the place and the regulations local.

- Office applications (basic knowledge), from calendar applications, OpenOffice, calculators or team coordination tools such as Microsoft Teams among others.

- "Knowledge" management applications such as evernote, notion or obsidian, which are highly configurable, powerful and useful since they can integrate not only organized information but can also be mixed with typical office automation functionalities, task or time management and extensions or integrations of other most varied tools (some even allow the creation of dynamic templates, custom UI, automation or programming for advanced users). Of course, achieving a high command of these tools can be very complex, but to cover some basic or more complex but punctual and extraordinary case, it can be interesting to have knowledge of this technology.

## *Others*



RFID> NFC automation: it uses the Radio Frequency IDentification technology, there are many different subclasses but the most suitable for this project may be NFC. It stands for Near Field Communication technology and it is usually the one that is closer to the general public due to its low price and simplicity (in exchange for some more industrial-like features such as long range and "high storage capacity").

- Reprogrammable NFC tags; Currently, the vast majority of mobile phones come with NFC functionality from the factory, which is increasingly popular. This technology allows the exchange of information between elements (passive or active) at short distances (normally <20cm). Commonly used for digital payments in physical stores, public transport, identification cards, "keys" by contact of garages and doors or digital business cards. The NFCtags are usually very cheap because the passive components (they do not need their own power source) are in the range of cents and although the readers (active components) have a higher price in the range of tens of euros for the reader/ writing, as mentioned before, most smartphones currently have this functionality integrated.

The process is usually as follows:
1. Data is written to one or more passive components by one active component (phone).
2. The NFCtag when the time comes enters within the range of a reader and transmits the data
3. The reader processes the data, usually it is connected to an "intelligent" system that interprets instructions.

Some of its applications can be:

- Perform simple actions or a succession of them in Mobile devices.
When a mobile detects a programmed NFCtag and the relevant permissions have been granted, it automatically activates the Wi-Fi and opens a schedule management application or perhaps opens a mail application when writing a new message addressed to a predefined person in the tag, make a call/video call, set an alarm/timer, etc.

- Save frequently used data: Since NFCtags can be very small, they are often sold in all kinds of shapes or embedded in all kinds of objects.

  This can be useful to save contact data, places, times or as direct access to certain compatible applications (by sending the data written in the tag beforehand)

- Make payments or procedures (confirmation required and depends on identification).

- Custom AAC [2] solutions.

# Innovative technologies and lines of research

On the topics covered in this section, some lines of innovation are:

1. Social networks evolve towards intuitive user experience, dynamism, interactivity and immediacy, each one competing to lead its field.
2. Management and office automation solutions in general seek either to greatly expand the functionalities, sacrificing simplicity and ease of learning, or to opt for a simple line but focused on a specific task. The latter usually seeks to have a multiplatform version, save data in the cloud or be easy to integrate with other services.
3. Development of new devices/software that can help in the management aspects discussed above.

## 6.4.    Accessibility

In this category, technologies, adaptations and access methods are grouped together with some good design practices that can help select some technologies over others to broaden the spectrum of people who can access and use the technologies mentioned in the previous categories.

Accessibility applies to both the elderly and caregivers, whether they have a great knowledge of technology or if it is the first contact, it is something transversal that must be considered and selected and adapted according to each person.

## Current state of the technology

Currently the field of accessibility is progressing little by little, although there is still a long way to go and the need of more awareness about the topic by the general population.

These advances have been especially noticeable in the digital field, largely due to the great leap and massification of technologies that in many cases have already become essential for the day-to-day life of the population.

There are some references and standards or good practice guides that will be mentioned here, although it must be considered that there is not a single universal line.

Since the variety of accessibility tools is as wide as the variety of people, it is not possible to cover all of them in this document, however some very important ones have been categorized:

*note: since these tools, adaptations and considerations can cover more than one category at a time, they will not be divided into categories, instead each one will have a reference on which categories of the 6 in total add more value.*

## *Screen readers*

This type of technology is based on software that tries to interpret what is shown on a digital screen and converts it into auditory or tactile stimuli to help mainly people with some type or degree of vision difficulty.

There are screen readers for the most common operating systems such as Windows, IOS (PC and mobile), Linux and Android.

The handling of screen readers is usually done through physical inputs such as keys, pushbuttons, buttons, adapted actuators and others. In the event that the output is auditory, the technologies in which the software is installed or embedded normally allow the connection of external headphones or speakers. In the event that the output is in the form of tactile stimuli, these will normally materialize in some Braille device, which will be discussed below in the next point.

These types of technologies and access methods mainly benefit people with visual difficulties.

When operated by keyboard, the most used controls are:

- Tab to next item.
- Tab + SHIFT for previous element.
- Enter to confirm, left click action (if right-handed mouse).

Some examples are:

- **Native windows screen reader:** (narrator) is activated and deactivated by pressing the WIN key (equivalent to CMD in IOS) + Ctrl + Enter. It is integrated into windows and allows navigation by areas (titles, list of links, paragraphs, sentences, words, letters...) as well as various customizations and methods to adjust to each person.
    - o complete guide to narrator: https://support.microsoft.com/en-us/windows/complete-guide-to-narrator-e4397a0d-ef4f-b386-d8ae-c172f109bdb1

    - o List of supported Baille displays: https://support.microsoft.com/en-us/windows/appendix-c-supported-braille-displays-65c40265-8aa6-9b53-9bc8-8a7a87e5dd8a#WindowsVersion=Windows_10

- JAWS (Job Access With Speech):
  Allows a user with reduced or no vision, as well as people with deafblindness, to interact with a device that has the operating system Windows by using the keyboard or a touch screen, obtaining voice response and / or in Braille format if used with a Braille line.
  https://www.freedomscientific.com/products/software/jaws/
  https://orientatech.es/lector-pantallas-jaws-windows

- Orca:  (https://help.gnome.org/users/orca/stable/)

Orca is a free, open source, flexible, and extensible screen reader that provides access to the graphical desktop via speech and refreshable braille.

Orca works with applications and toolkits that support the Assistive Technology Service Provider Interface (AT-SPI), which is the primary assistive technology infrastructure for Linux and Solaris. [13]

- Voice Over, Apple native PC & mobile tool:  ([https://support.apple.com/es-es/guide/voiceover-guide/welcome/web](https://support.apple.com/es-es/guide/voiceover-guide/welcome/web))

 recommended just with safari browser, not suitable for push buttons integration.

Gesture cheatsheets:
  o [https://media.dequeuniversity.com/courses/generic/testing-screen-readers/2.0/en/docs/voiceover-ios-images-guide.pdf](https://media.dequeuniversity.com/courses/generic/testing-screen-readers/2.0/en/docs/voiceover-ios-images-guide.pdf)
  o [https://media.dequeuniversity.com/courses/generic/testing-screen-readers/2.0/en/docs/voiceover-ios-guide.pdf--](https://media.dequeuniversity.com/courses/generic/testing-screen-readers/2.0/en/docs/voiceover-ios-guide.pdf--)

- popular browser extensions with similar functionalities (chrome, opera, firefox, safari).

- Talkback:  Android screen reader native tool.

  o Activation
    1. On your device, open Settings.
    2. Select Accessibility and then TalkBack.
    3. Turn Use TalkBack on or off.
    4. Select Ok.

  o Explore by swiping:
    1. To move between items on the Home screen, swipe left or right.
    2. Focus on the item you want.
    3. As you navigate, TalkBack announces where your focus is.
    4. Anywhere on your screen, double-tap.

  o Explore by touch
    1. Touch the screen with one finger.
    2. Drag your finger across the items until the focus is on the item you want.
3. Anywhere on your screen, double-tap.
   More info: ([https://support.google.com/accessibility/android/topic/10601570?hl=en&ref_topic=3529932](https://support.google.com/accessibility/android/topic/10601570?hl=en&ref_topic=3529932))

## Braille lines

This type of technology is based on adapted hardware that interprets input and output in Braille format (consisting on six-dotted "cells" in which the different combinations are encoded following the braille alphabet), that is, the basic Braille lines have a lot of similarity to the "perkins" analog paper typewriters still in use, but the interpretation of Braille is made through some mechanical braille units, sort of "cells" consisting on 6 with its possibles ups and downs positions to represent each symbol from de Braille alphabet.This type of technologies are often connected to the main device via Bluetooth or direct cabling, with or without incorporated keyboard.
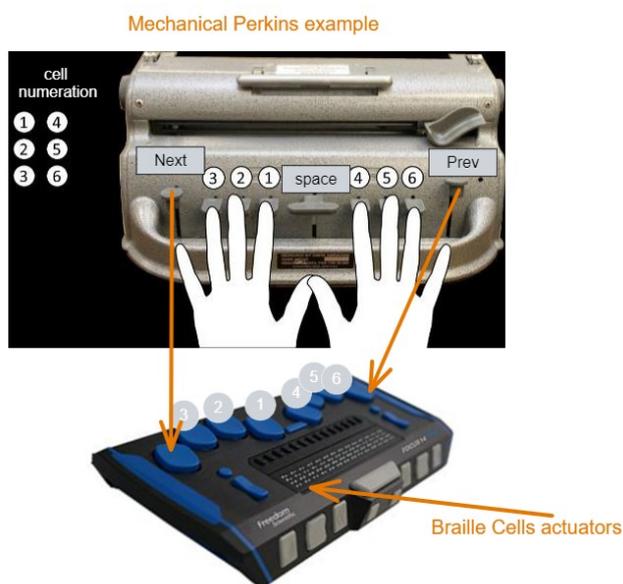


*Figure 29 Traditional Braille "Perkins" machine and digital braille line*

There are some Braille access methods apps such as Talkback Braille:

- **Talkback Braille keyboard:** (https://orientatech.es/en/braille-talkback-keyboard)

  The Talkback Braille keyboard is a screen input method, which is part of the accessibility application developed by Google, called Talkback, included, but not activated, by default on Android devices.

  The great advantage of this keyboard is that we do not need any additional hardware to be able to write text on the device, acting as a virtual keyboard.



*Figure 30 Braille Talkback keyboard*

## OCR and Object recognition Neural Network solutions

This category includes solutions, tools and access methods that implement some kind of image pattern recognition using AI and Computer Vision.

Currently image processing and the state of the art in object recognition is closely linked to neural networks and AI. Broadly speaking, neural networks are trained based on a large number of examples from which they learn to identify general patterns. The training process is very complex and heavy but once finished, the neural network can be replicated and executed very quickly.

The most relevant examples for the project are:

Traditional or specific Optical Character Recognition solutions as well as object, person and environment recognition solutions:

**Google lens:** (https://lens.google/intl/en-419/) (https://orientatech.es/en/google-lens)

This application uses the latest advances in artificial intelligence and computer vision to allow the following actions to be carried out from any smartphone (android) or from the Google search engine itself:

- Recognition of printed or handwritten text. Once the text has been identified, the app allows you to do the following:
  - Scan and copy it to an android or send the text to any computer that is logged in with the same google account registered on the phone at that time



*Figure 31 Google lens basic OCR example*

*Figure 32 Google lens send text to PC example*

- Make the device read the text aloud by means of voice synthesis (it is compatible with the google assistant voice assistant)

- Translate AR content overlaying the translated text on the image itself:

  - [Video demonstration](#)



*Figure 33 Google lens AR translation example*

- If the text is a contact card: allows you to save the information as a contact in the phone directly

- If the text consists of mathematical exercises: it allows recognizing the steps to solve the problems and searching for external school resources that may be useful.
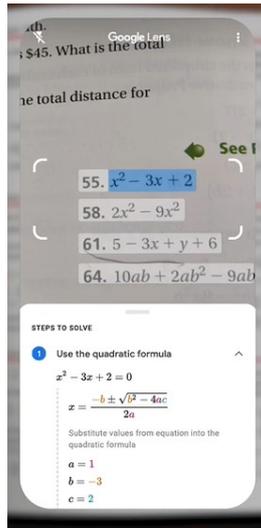
*Figure 34Google lens Math problem solving AR assistant*

- If the text belongs to the label of a parcel shipment, it allows searching for the tracking of the parcel directly with the identified data.



*Figure 35 Parcel AR identification caption from [14]*

- Image recognition:

    - Allows you to search by images or identify objects such as plants, furniture, emblematic locations, etc...

*Figure 36 Google lens image and plant identification example*

- Allows you to identify some photos of goods, furniture, food and associate them with the store where they were purchased (including restaurant or food stores)
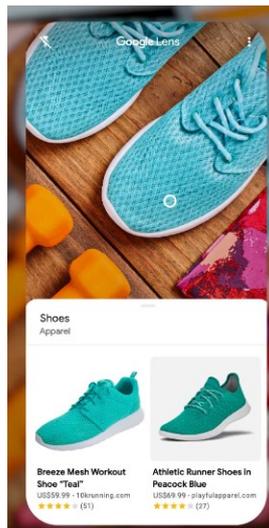


*Figure 37 Google lens product identification example*

- Allows you to identify book covers and offers you the synopsis for free as well as options to buy them.

- From time to time they include new functionalities.

- **Voice Access** and its innovative icon recognition neural network: (https://play.google.com/store/apps/details?id=com.google.android.apps.accessibility.voice access&hl=es&gl=US) (https://www.orientatech.es/voice-access)

Voice access is an application that forms a new approach to a previously used access methods only through voice, requiring a certain degree of vision in the interactions.

This access method is mainly aimed at people with manipulation or mobility difficulties who, through voice commands, allow the main actions of a smartphone to be carried out on any screen or necessary application.

The application is very configurable but the main functionalities are:

- division of the screen into smaller and smaller numbered grids ending in the desired action at the desired point on the screen.



*Figure 38 Example caption of Voice access review made by TECSOS in Orientatech.es*

- Selection of well-identified items in the different application
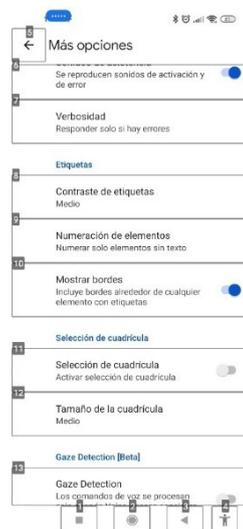


*Figure 39 Example caption of Voice access review made by TECSOS in Orientatech.es 2*

- Activation of a novel icon recognition functionality:

The labels and the alternative text of some elements of the user interfaces are very important to increase the number of people who can access the information, but unfortunately it is a reality that many applications and websites do not implement these basic functionalities.

To improve this big problem, through a google AI, Voice Access allows you to identify new labels to some icons based only on their layout and visual components (pixel information).

It is a very innovative solution in the environment and it is one of the only apps that implement this type of AI solution.(https://ai.googleblog.com/2021/01/improving-mobile-app-accessibility-with.html)

## *Voice synthesis and recognition solutions*

There are many synthesis and voice recognition solutions, here are some examples:

- Call or Videocall incorporated transcriptions/subtitles:
    - o Roger Voice: https://www.orientatech.es/rogervoice
    - o Google meet: https://www.orientatech.es/en/transcripcion-google-meet
    - o Android instant transcription: https://www.orientatech.es/en/transcripcion-instantanea-android
    - o Teams and Skype from Microsoft
    - o Zoom meetings: https://support.zoom.us/hc/en-us/articles/115004794983-Audio-transcription-for-cloud-recordings

- Voice assistants also use this technology a lot. (see Voice assistants on page 67)

- Media content portals such as Youtube, vimeo, etc… also has transcription solutions built-in.

- AI-based apps usually have this type of functionalities too:
    - o https://www.orientatech.es/lookout-google
    - o https://www.orientatech.es/aplicacion-seeing-ai

- Specific apps:
    - o Tleo: https://www.orientatech.es/en/tleo
    - o Listen All: https://www.orientatech.es/en/listenall
    - o AAC voice assistant: https://www.orientatech.es/en/asistente-voz-aac

## Eye-tracking data or blink data as input solutions

This type of solutions are very usefull specially ALS patients, people with reduced mobility or speech difficulties. Some informative examples are:

- Look to speak: ([https://www.orientatech.es/look-speak](https://www.orientatech.es/look-speak))

- Eva-facialMouse:
    - ([https://www.orientatech.es/eva-facial-mouse-pro](https://www.orientatech.es/eva-facial-mouse-pro))
    - ([https://play.google.com/store/apps/details?id=com.crea_si.eviacam.service&hl=en](https://play.google.com/store/apps/details?id=com.crea_si.eviacam.service&hl=en))
    - ([https://github.com/cmauri/eva_facial_mouse](https://github.com/cmauri/eva_facial_mouse))

- Tallk app: ([https://www.orientatech.es/en/tallk-app](https://www.orientatech.es/en/tallk-app))

It uses an eye-tracking technology that allows the compatible Samsung tablet to be operated only with the movement of the user's eyes. It was part of the project "Technology with Purpose" of Samsung Spain to put technology at the service of people, specifically this application has been developed together with the Luzón Foundation, an organization deeply involved with the improvement of the quality of life and independence of the people with ALS and their family members.
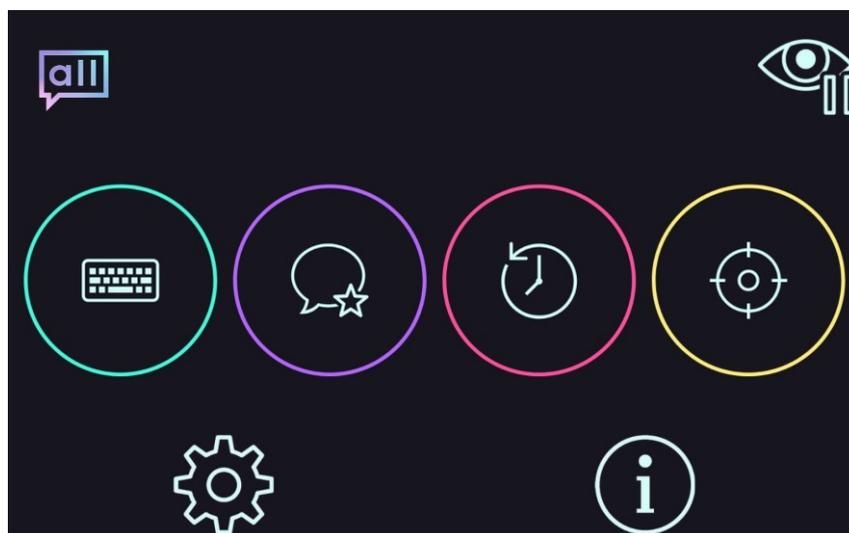


*Figure 40 Main menu of TallkApp*

Other non-Spanish and not tested by TECSOS examples may be:

- [https://www.jabberwockyapp.com/aac](https://www.jabberwockyapp.com/aac)
- [https://ihavevoice.app/](https://ihavevoice.app/)

## *Pictograms*

Regarding Augmentative and Alternative Comunication methods, pictograms are a commonly used solution and it is very easily implemented or integrated with technology solutions.

This pictogram imformation is based in this CEAPAT guide, ARASAAC resources and Sclera symbol webpage resources. These are highly recommended resources to obtain more information regarding AAC methods and software options.

A pictogram is a drawing that can represent a concrete reality (e.g. an object, animal, person, etc.), an abstract reality (e.g. a feeling), an action, (e.g. reading), and even a grammatical element (e.g. adjectives, conjunctions, articles, prepositions, etc).

Pictographic communicators and software base their use on pictograms built into templates and various layouts.
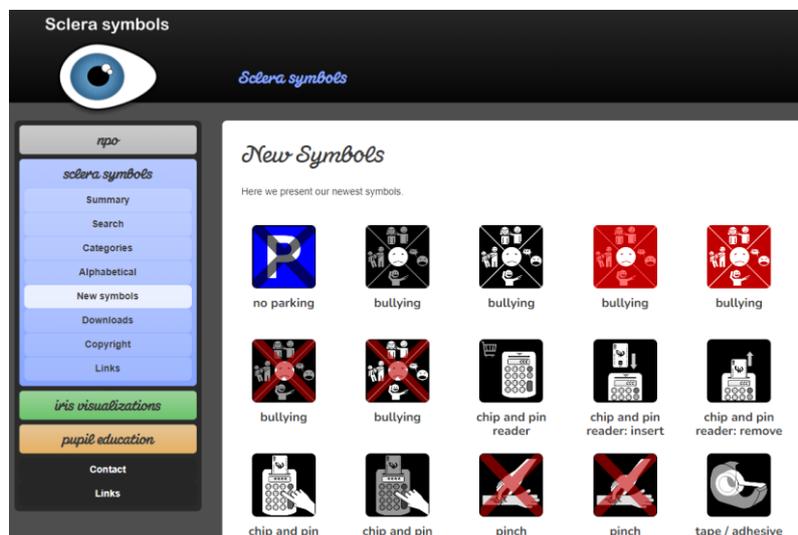


*Figure 41 Sclera symbol webpage caption*

## *Magnifying lenses*

This type of tools help magnifying visual content from digital screens to offer yet a simple tool but very helpful without too much effort if they are known by people with visual difficulties.

- How to zoom in or out on Mac: ([https://support.apple.com/en-us/HT210978](https://support.apple.com/en-us/HT210978))
  To set up zoom, choose **Apple menu > System Preferences, then click Accessibility**. Click Zoom in the sidebar, then select the zoom features.

  To switch between no zoom and your last amount of zoom, press these three keys together: **Option, Command, and 8.**

- Using magnifier on Windows: ([https://support.microsoft.com/en-us/topic/setting-up-and-using-magnifier-e1330ccd-8d5c-2b3c-d383-fd202808c71a)](https://support.microsoft.com/en-us/topic/setting-up-and-using-magnifier-e1330ccd-8d5c-2b3c-d383-fd202808c71a))

  Press the **Windows logo key + Plus (+) or Minus (-)** to zoom in and out.

  You can change your magnifier view by pressing **Ctrl + Alt + M –** this will cycle through full screen mode, a floating transparent magnifying glass, or docked.

- There are many free magnifying solutions for mobile devices on the various app Markets.

## *NFC solutions*

NFC is also used to build communication and task boards to help autism spectrum disorder people or people with communication difficulties. [15]

# Innovative technologies and lines of research

Due to the extense variety of these tools, technologies and access methods, the innovative trends are very difficult to specify, but some general trends are:

- Using NFC technologies to built accessible features and sometimes embed them inside more complex objects or technological devices.

- User Interface and User eXperience researches to make the digital world more accessible (e.g. dyslexia related fonts or flexible website design frameworks to adapt to different UX needs)

- Research inside de AI field and human-computer interactions or computer-sensing related real-world simulations.

Although, the most important trends are the efforts to standardize and regulate good practices and rules to consider when it comes to digital accessibility.

Special mentions to WCAG 3.0 (W3consortium Accessibility Guidelines) from W3Consortium and the efforts from big technological companies such as Google, Microsoft or Apple for including specific accessibility tools and guides. Also, it is worth to mention that most of the bigger web browsers have accessibility extensions, for example chrome accessibility tools:

(copy this line as an URL inside Google Chrome): chrome://settings/accessibility

https://chrome.google.com/webstore/category/collection/3p_accessibility_extensions

Some important considerations are:

- Use combined stimulus to represent meaning, to broaden the target people and consider the spectrum of sensoric diversity people may experience. It is not a good practice to tightly link concepts and meanings to only one stimulus.

- Simple, coherence and clear UX: the first thing to consider is reducer complexity to ease the introduction of other accessibility methods and tools.

  Consider the existence of Sign language and maybe the use of transcription services if required. Also, include alternative text and subtitles whenever is possible.

- Add option to change to High Contrast mode, change font size, etc... and also try not to use color as the only way to represent an aspect of the system. e.g. use shape and not only color to represent different concepts because if not, it is very difficult or impossible for colorblind people to distinguish them.

- Consider pushbuttons and hardware adaptations regarding UX and designing technology processes.

# 7. Selection of the technologies

In this section the following technologies will be covered in depth:

1. Teleassistance

2. Voice assistants

3. Elderly adapted phone launchers
    a. Bald Phone
    b. Simple mode app

4. Elderly adapted phones
    a. Swissvoice D28
    b. Doro Liberto 820 mini
    a. Telefunken TM360Cosi

2. Emotional support solutions
    a. JoinTalk
    b. Petit Bambou

3. Cognitive stimulation apps
    a. Lumosity
    b. Neuronation
    c. Cognifit
    d. Memorado

5. Medication adherence apps
    a. Calendula
    b. Medisafe
    c. MyTherapy

6. Tracking, GPS-based and alarm apps
    a. Life 360
    b. SMS Samsung alert
    c. Durcal

# 7.1.  Teleassistance

This section will cover the differences between Teleassistance and Telealarm services, as well as the implications of each one for home risk management. Services may vary from one country to another and the different service providers may offer very different benefits, some providers are more socially involved than others, this should be specially accounted regarding the importance of the human side of the needs they are offering to cover. Due to the complexity of this regards, there is no point on reccomending specific options when it comes to teleassistance service providers.

On the other hand, some examples of multinational device providers are:

- Tunstall (https://www.tunstall.com/resources/productdatasheets/)
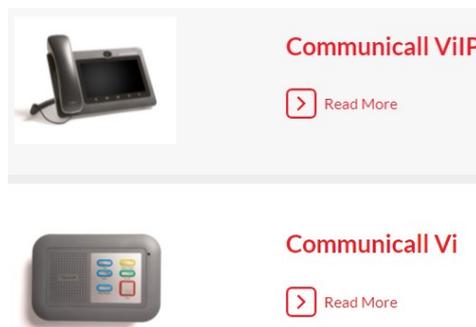


*Figure 42 Examples of Tunstall devices part 1*
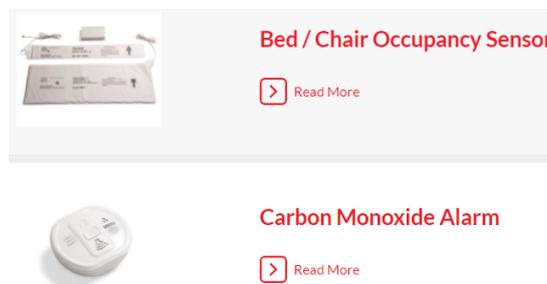


*Figure 43 Examples of Tunstall devices part 2*

- Neat (https://neat-group.com/solutions)
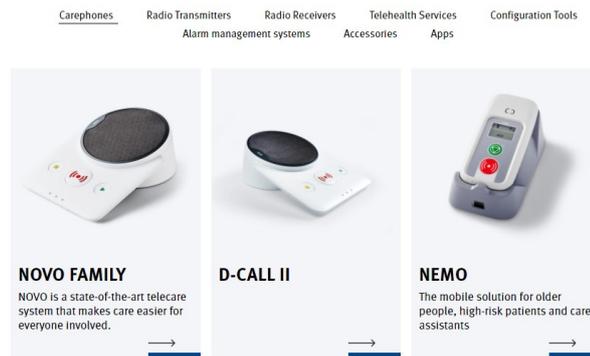
*Figure 44 Examples of Neat devices*

## Teleassistance VS Telealarms:

Regarding telecare, a differentiation is usually made between the most common services on the market. We will use two terms, Teleassistance and Telealarm.

- o Tele-alarm services:
  Are those that are limited to a monitoring environment and an emergency warning system or warning to third parties with little or no more information than the warning of the risk that the monitored person may be in a risk situation.
  These services may include 24-hour telematic assistance, although low or stable levels of response time are not always guaranteed. These services sometimes also offer extra funcitonalities depending on the modality.
  The main differentiation between the two terms is whether or not the devices that are used or services that are provided comply with the standard established for Teleassistance (in Spain: UNE 158401) and if the service offers a more social and closer approach to the users of their services.

- o Teleassistance services:
  They are those that comply with current regulations on service standards and devices (microphone and speaker specifications, reliability and security of communications, resistance against water of a certain level, etc...). In addition to the established minimums, Teleassistance services sometimes offer a more extensive service, depending on the modality (see below).

### Monitoring and follow-up:

Normally, in addition to 24-hour assistance in the event of an emergency or if the attention of a human operator is required (by pressing a button as a general rule), assistance is guaranteed for breakdowns in a limited period of time, terminal tests (to check that everything works correctly), etc... or depending on the modality, a series of monitoring and follow-up services can be offered, such as:

- Familiarization call after x days of installation
- Birthday call
- Follow-up call after emergency (including hospitalizations among others)
- Periodic follow-up calls
- Medication reminder calls
- Medical appointment schedule
- Geolocation & safezones (if the geolocated person crosses the limits of the safe zone border, the system rises an alarm)
- Health monitoring
- Security monitoring (alarms)
- Call family or caregivers
- Participation in complementary activities
- Accompanying activities:
    - Support carrying out medical, administrative procedures, etc …
    - Visit of person at home
- Adapted devices (hearing, physical or visual difficulties)
- Extraordinary services such as:
    - Keys custody
    - Mobile unit
    - Safety sensors (smoke, gas, flood)
    - Habit control sensors (opening sensors, door/window/fridge sensors or presence sensors)

With sufficient intelligence, the system can analyze unusual habits to detect risk situations such as: the person not returning at night, the first activity time much later than usual, too often/infrequently in a room, fridge, bathroom etc...

In the case of specific and simple sensors, they can set off the risk alarm in the home, triggering an entire structured process aimed at solving the needs of the person in the adequate manner that fits the best for each person.

## Emergency notification:

When notifying emergencies, as a general rule, in telealarm services, only a risk is reported in the location in question, while in teleassistance the emergency call is made with information previously collected from a general medical profile.

In some cases, a medical report is requested (which greatly delays the discharge date of the service), although the most common is that only certain relevant data is collected, in order to better attend the service or for possible calls to emergencies.

Regarding the data collected for emergencies, the most common ones are serious ailments, recently registered events (if they are relevant), allergies, adverse drug reactions if any, and relevant medication due to possible incompatibilities.

Regarding the raising of automatic alarms, the explicit request by pressing a button or similar, security sensors (smoke, gas, flood, theft, etc...) or sometimes there are rules that, thanks to the monitoring of habits and presence, exceptional emergency risk situations can be detected.

The people who attend these services are the main gear of telecare and assistance to the users of these services, technology is a fundamental part that connects and provides security, tranquility and reliability to this type of service.

## 7.2.    Voice assistants

As mentioned previously in chapter 3, virtual assistants allow human-machine interaction through the use of natural language thanks to the conversational processing of Artificial Intelligence in a fluid way.

The most common voice assistants are: Alexa (Amazon), Siri (Apple), Google assistant or Bixby (Samsung). Virtual assistants will be covered in more depth in Chapter 4.

Amazon Alexa stands out in the conversation capabilities and "closeness" and simplicity of interactions while Google Assistant stands out in the most functional part and home automation features, in case of Google Assistant, the AI is not personified so much and in both cases connection to Internet is required.

Both have devices for audiovisual content, although some of the models with a Google screen do not have a built-in video camera, which is very positive with regard to the possibility of making video calls, this is included in all the most complex Amazon devices (those that they have a screen and not just a speaker and microphone). In some case the device has a limited ability to move, for example: Alexa echo Show 10.

Some devices allow you to control the TV and its functionalities with your voice. For example, the fire Stick range (with a plug-in device) or the functions integrated in Samsung SmartTVs.

([https://www.samsung.com/uk/tvs/smart-tv/voice-assistants/](https://www.samsung.com/uk/tvs/smart-tv/voice-assistants/)).
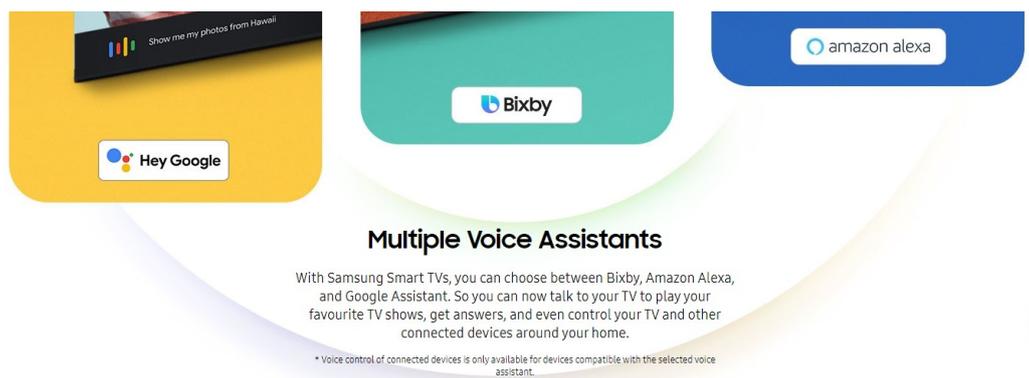


*Figure 45 Samsung compatible with multiple Voice assistants*

To complement this point, Orientatech links regarding virtual assistants are included:

("ctrl+click" the image to open link on the web browser or visit orientatech.es/en)



*Figure 46 Siri Review by TECSOS in Orientatech.es*



*Figure 47 Google Assistant Review by TECSOS in Orientatech.es*
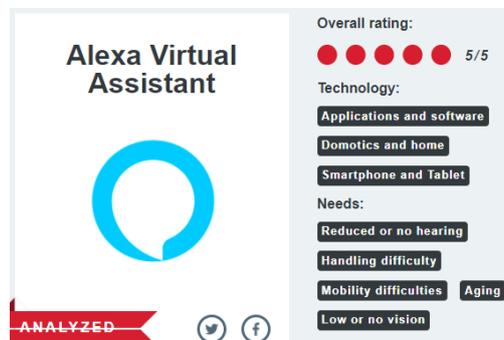


*Figure 48 Alexa Review by TECSOS in Orientatech.es*

Some models or assistants are capable of distinguishing different people and personalizing commands and information based on voice (and in some cases for more precision using facial recognition)

It allows executing commands without using a static formula, that is, the AI will interpret more or less **the same command** if we tell it the following phrases:

- o   I want to see the weather in my area.
- o   show weather in street X, number Y zip code Z.
- o   Hello please. I kindly ask you to tell me the weather here in my house where I live, thank you.

The functionalities can allow access to location, time zone, mobility preferences among others, this allows the AI to assume certain data for the queries, if it is not previously configured, it will have to be indicated in each query (or the AI will guide you in the process through questions).

Some examples of useful features:

- Video calls between compatible devices in general, usually smartphones, tablets or other more specific devices (echo show, nest MAX hub, fire TV Cube). It may seem like a simple functionality but it is very powerful as a tool to support other solutions that are included in this document, it can connect in a simple and friendly way with bidirectional video and audio.

- Information queries: time, calculator, Conversion of measures (how many tablespoons is a cup of sugar), wikipedia, synonyms, calendar queries, dictionaries, biographies, travel time from point A (default current location) to point B, knowledge available on the internet (specific searches or information snippets)

- Multimedia: Access to music, news, YouTube, radio, photos, podcasts, cooking recipes, audiobooks, movies, series, TV channels (usually through the Internet), live broadcast platforms, remote cameras (with permissions), etc...

- Specific applications (non-native): meditation, cognitive stimulation activities, health apps, medication adherence apps, social networks (especially Google more than Alexa), games, museum apps, theaters, more specific apps. There is a wide variety and many times they are language dependent.

- Home automation control. Turn on/off, synchronize with music, dim/increase lights intensity, turn on/off switches (which can be named by what is plugged in to help management eg turn on automatic irrigation), air conditioning, blinds, TV, etc...
It offers great value especially for certain people with vision, manipulation or mobility difficulties, although it should be borne in mind that in terms of use it is highly recommended not to overload caregivers or the elderly with this type of functionality. As a general rule, it is recommended to only adapt interactions that the person has already been carrying out in their day-to-day life and not include new interactions.

- Conversation, jokes, casual chat.

- Schedule of personalized routines, reminders, alarms, lists (shopping, things to do), etc...
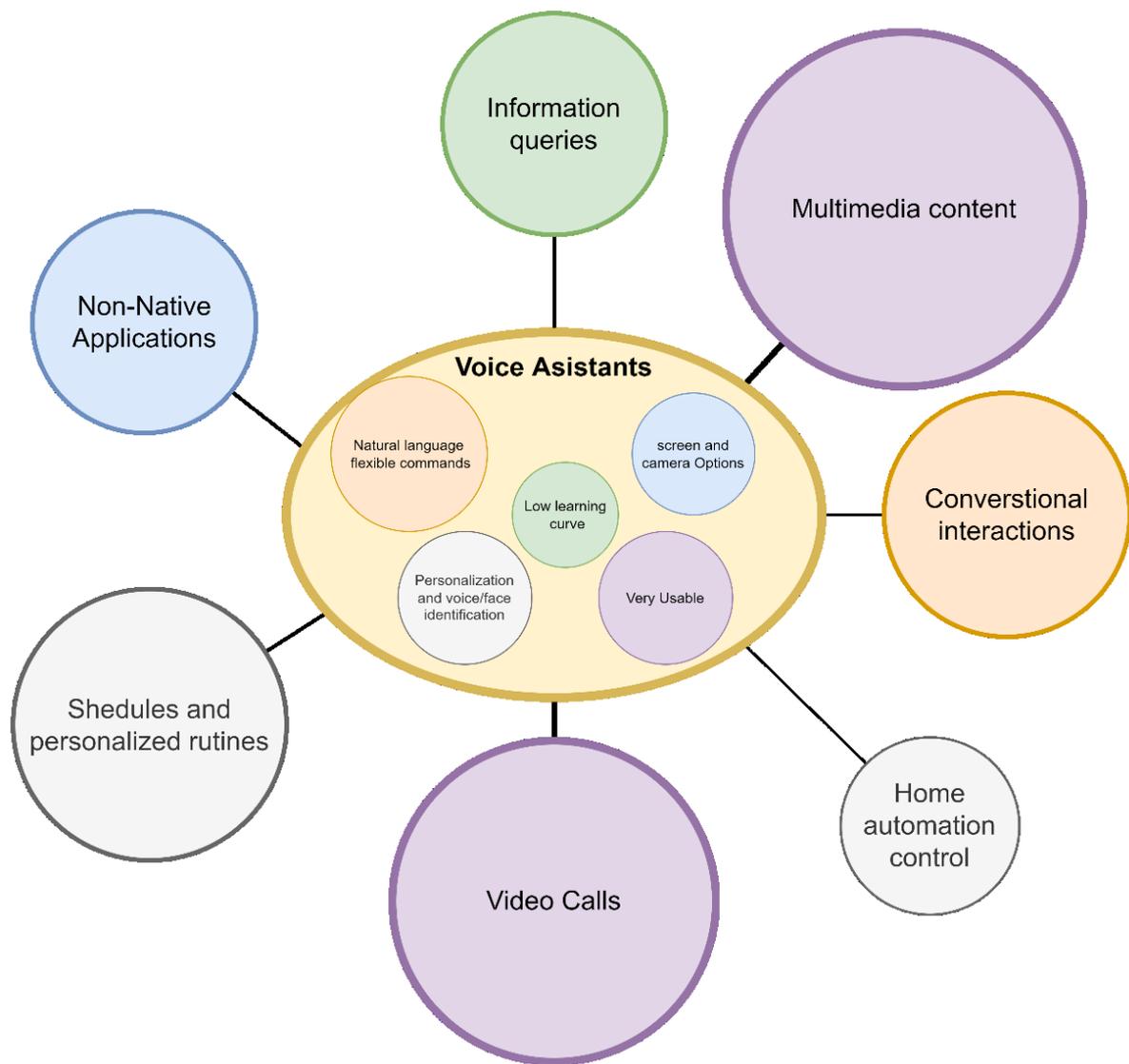
*Figure 49 Voice assistants infographic*

To better illustrate the capabilities of voice assistants in the field of care for the elderly, an experience of TECSOS with the **pilot project of the Spanish Red Cross and Alexa** in the year 2020/21 will be briefly presented.

As a result of the Coronavirus pandemic crisis, the Spanish Red Cross, which already had a very simple Skill (a term equivalent to a voice App in Alexa) at the time, decided to evolve it by including already developed content shared at that moment at the web regarding some topics like: help people understand and learn about COVID, first aid and have videos of maintenance exercises oriented above all so that the elderly could have a guide and perform simple but effective exercises from their homes. At that time the quarantines began and people were very affected by the circumstances around them.

The development was done in an agile and fast way. The pilot in question included the installation of around 100 devices between the homes of the users and the assemblies where the volunteers contacted them through Alexa and the video call function with them.

The sessions were organized around a guide with simple and very specific challenges that were raised as each person progressed throughout the weeks. How to open and use the red cross skill, how to request the time and weather, play the radio or music, add a reminder, add and remove items from the shopping list or make a video call, among others.

The conclusions are extracted from the following web address (in Spanish) that it is recommended to visit for more information:

https://www2.cruzroja.es/web/ahora/-/tecnologia-voz-impacta-positivamente-calidad-vida-personas-mayores [16]

https://www2.cruzroja.es/web/ahora/-/la-vida-con-alexa ("life with Alexa" video)



*Figure 50 Life With Alexa (Spanish Red Cross) video*

- The initial impetus for experimentation with Alexa is trust in the Red Cross. That confidence in the Organization has been fundamental to participating in the project.

- Music is the star content for users who have participated in the study, followed by video calls and the request to listen to the radio. Music is especially important for the most vulnerable people, who are those with the lowest digital permeability.

- In their interaction with Alexa, people used terms like "thank you" or "good night". This means that for users, they are not only relating to an object, but rather personifying it. It's not just voice technology.

- According to the volunteers surveyed, there is a positive impact on the quality of life of the people who used this technology. Alexa has helped them to gain

autonomy (56.5%), to communicate better with family and friends (59.7%), to better organize their day-to-day activities (64.5%), to improve their entertainment (80.6 %), to feel more accompanied (69.4%) and to prevent or alleviate loneliness (69.4%).

- Users feel that the voice assistant keeps them company, which leads to a perception of empowerment due to access to technology that allows them to update their lives through three elements: the presence of the device, which has the ability to reduce the perception of loneliness through that feeling of "being in conversation with someone" that facilitates what the user requires; video calls that allow you to connect with family and friends; and the contents that depend on the interest of the person and that fulfill diverse functions: leisure, information, knowledge, culturality...

# 7.3.    Elderly adapted phone launchers

## Bald Phone


PHONE([https://orientatech.es/en/bald-phone](https://orientatech.es/en/bald-phone))

Launcher for Android devices designed for the elderly, people with manipulation difficulties and people with reduced or no vision.

The launcher has a configurable interface and easy access to the different features.

It offers several accessibility features, such as a large and modifiable icon size, configurable text size, highly simplified menus, guided tutorials and adaptability to different degrees of accessibility.

In addition, it is important to highlight the great compatibility that the application has with the TalkBack screen reader.

**Functionalities:**



*Figure 51 Bald Phone Accessibility*

**Accessibility level** selection:
This will set the button delay and scroll mode in the app. The application offers us the following levels:

- High:
  There is a long delay when pressing the buttons and scrolling is done with arrows.

- Intermediate:
  The delay when pressing the buttons is less than the previous one and the movement is also done with arrows.

- Normal:
  There is no delay when pressing and the vertical displacement is done with the finger.

At the top of the screen we can see the following options:



Figure 52 Bald Phone Top Options

Emergency:
Possibility to add three emergency contacts.

Battery:
Indicates the percentage of charge of our device.

Flashlight:
Activates or deactivates the flashlight.

Device mode:
Changes the device to vibration, silent or sound mode.

Notifications:
Opens a window where notifications from certain applications will appear.

Among the native applications of the launcher we highlight the so-called "Pills":

Pills: Allows to stablish reminders of the medications.

It is also worth mentioning the existence of black arrows located at the bottom of the screen. Pressing these arrows allows you to switch between the different pages available in the launcher easily.

Definitions and guides page in video format:



Settings:
This section allows us to configure certain basic characteristics.

Guides in video format:
some tutorials will be shown.
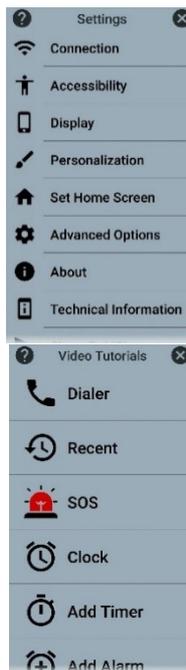
In the accessibility section we find:

- Modify the size of the text.

- Dominant hand selection.

- Accidental touch protection.

*Figure 53 Bald Phone settings*

Finally, on the last page of the launcher we have the possibility to create the notes that we want. These notes cannot be entered via the touch keyboard or via voice recognition:
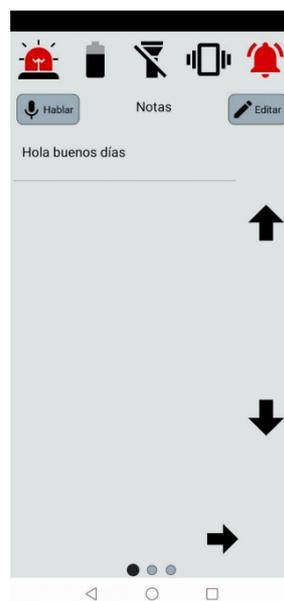


*Figure 54 Bald Phone navigation*

## *Simple mode app*

([https://orientatech.es/en/lanzador-modo-facil](https://orientatech.es/en/lanzador-modo-facil))

Launcher for Android devices that simplifies the operation of our mobile phones and offers an alternative to older people with little experience with smartphones or people with impaired vision or cognitive difficulties.

Among its main features we highlight the possibility of configuring the size of the icons, a very fast and simple access to contacts and a home page with the apps that we are going to use the most.

**Functionalities:**

*NOTE: consider selecting the app as a startup application.*

To move from one page to another, simply slide the screen to the right or left, paying attention to the white dots at the bottom of the screen.
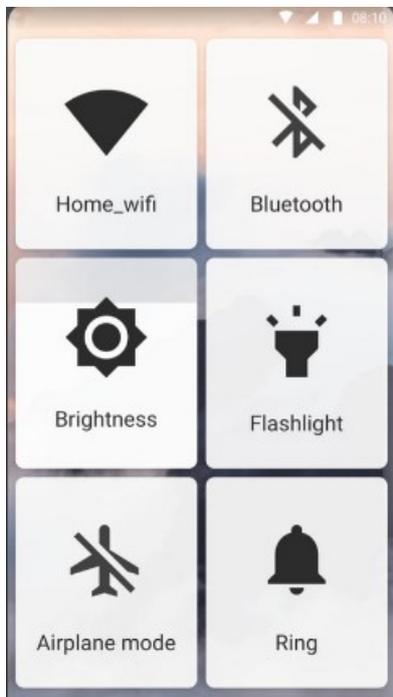


First screen:

It allows us to control the most basic settings of our phone.

To activate or deactivate the different functionalities, simply click on the respective associated icons.

The only functionality that is adjusted differently and not by clicking on the associated icon is Brightness, which allows more degrees of control over the intensity of the light.

*Figure 55 Simple mode app menu*

Second screen:

Page associated with the user's Contacts.

From this screen you can quickly access the contacts that are selected as most important to the user, so that you can call or send a message to these contacts in a simple and fast way.
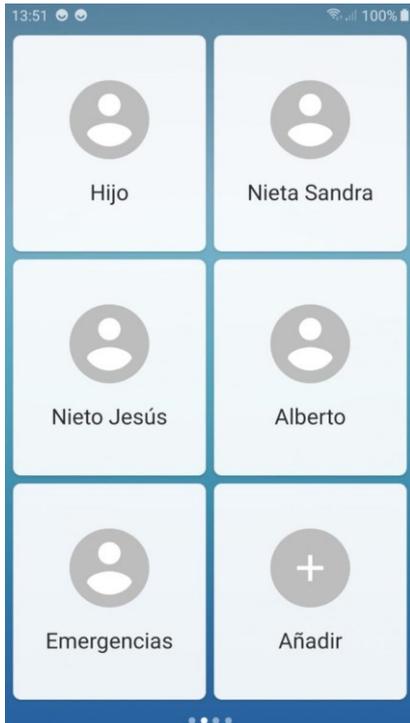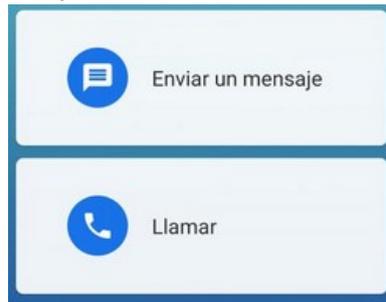


*Figure 56 Simple mode app Contacts*     *Figure 57 Simple mode app communications*

Only a maximum of 6 quick contacts are allowed, leaving the rest of the contacts that we have saved, in a conventional agenda.



Third screen:

Main screen of this launcher. On this screen we must place those applications that are going to be used most frequently. The date and time will also be displayed by default

In case more than 4 are added, new screens will be created by grouping applications 6 by 6.

*Figure 58 Simple mode app main screen*

## 7.4.   Elderly adapted phones

*Swissvoice D28*
([https://www.orientatech.es/en/telefono-mayores-swissvoice-d28](https://www.orientatech.es/en/telefono-mayores-swissvoice-d28))

The Swissvoice D28 model is a phone designed for the elderly that stands out for its simplicity. This simplicity is achieved with the addition of large buttons, a charging base, voice key reading and simple menus. In addition, it has FM radio.

**Appearance and basic funcitonalities**

This device has a folding screen that has an additional external display for viewing notifications such as the time, incoming call or SMS, charging or battery status.

The terminal has well-identified buttons, highlighting the buttons dedicated to the camera, the agenda and the flashlight. The volume up and down buttons are located on the sides.



*Figure 59 Swissvoice D28 1*

Navigation through the menu is simple and has large icons. In addition, it can be easily returned to the initial state by using the red key or by lowering the cover of the mobile phone.

Calls and SMS can be made in a simple way, accessing the agenda with the contacts button.

On its back is the SOS button, which can be configured with a phone number that will automatically make a call when you press it.

*Figure 60 Swissvoice D28 2*

On the outside of the lid is a 2MP camera. To use it, just press the camera button.

To charge the mobile in a simple way, a charging station is used. The standby autonomy is up to 7 days and in communication up to 5 hours according to the manufacturer.



*Figure 61 Swissvoice D28 3*

Other features that the terminal has are FM radio, Mp3 audio playback, recorder, calculator, magnifying glass, flashlight, alarm and calendar.

There is the possibility of adding an external SD card to store photos or audio.

It has the following forms of connectivity: 2G, Bluetooth 3.0 and micro USB.

It has voice key reading, but not a screen reader for all menus.

Features HAC compatibility with M4/T4 hearing aids.

## Doro Liberto 820 mini

([https://www.orientatech.es/en/telefono-mayores-doro-liberto-820-mini](https://www.orientatech.es/en/telefono-mayores-doro-liberto-820-mini))

Doro Liberto 820 mini is a touch screen Smartphone with menus adapted to the elderly people needs. It has an Android operating system.

**Appearance and basic functionalities**

The terminal has a 4'' TFT touch screen and some additional physical buttons such as power, photography, volume control, back or initial menu.

The alphanumeric keyboard is displayed on the screen. It also has a help button and a charging base.



*Figure 62 Doro Liberto 820 mini 1*

The device incorporates an adapted version of Android, which simplifies functionalities such as calls, being able to make them using shortcuts with photos. It also includes a feature called startup guide that allows you to easily configure the main options the first time you use the phone or whenever you want to reset it.

Other additional features that this device has are FM radio, audio playback in mp3 or wav format, magnifying glass, flashlight, alarm, calendar, stopwatch, weather information,

recorder, input of manual notes, calculator and safe section for store information with password.

The SOS button is located on the back of the mobile and can be configured to send an alert call and SMS to the indicated phone. It can also be configured to send the location in an emergency.



*Figure 63 Doro Liberto 820 mini 2*

There is a 0.3MP camera on the front and a 5MP camera with flash on the back.

The charging base that it incorporates allows it to be placed in a horizontal position, and can serve as a photo frame or digital clock. According to the manufacturer, the autonomy of the battery is 500 hours in standby and 18 hours when speaking.

*Figure 64 Doro Liberto 820 mini 3*

The phone has 4GB of internal memory and the option to add an external SD of up to 32GB.

It features HAC compatibility with hearing aids and the ability to use the Android Talkback screen reader.

It has the following forms of connectivity: 3G Dual SIM, Wi-Fi, Bluetooth and GPS for the use of applications such as Google maps

# Telefunken TM360Cosi

(https://www.orientatech.es/en/telefono-mayores-telefunken-tm360cosi)

The TM360 Model of the Telefunken brand is a telephone that has some features designed for the elderly, such as the SOS button or the charging base. It includes some additional functionalities that this type of terminal does not usually have, such as the possibility of connecting to the Internet or access to certain social networks.

**Appearance and basic functionalities**

The terminal has large keys with contrast and a flip-up screen. It contains exclusive camera and social network keys, memory keys for frequent numbers (M1 and M2) and an on/off switch for the flashlight.

*Figure 65 TM360 Telefunken 1*

The font size displayed on the screen is large and can be configured.

The SOS button is located on the back, and can be configured to send a message for help and call a trusted contact. In addition, pressing this button will activate an audible alarm that will alert people around the person.



*Figure 66 TM360 Telefunken 2*

The camera allows you to record video and take photos, and is located on the outside of the cover, next to the light signal for WhatsApp, missed call and battery charge.

To charge the mobile in a simple way, a charging station is used. The battery has a capacity of 1000 mAh.



*Figure 67 TM360 Telefunken 3*

The phone has a 1GB SD card, but it allows you to use an SD card with up to 32GB of storage.

This terminal has 3G connectivity, Wi-Fi and Bluetooth.

Other features included are FM radio, audio recording, flashlight, calendar, alarm, unit converter, world clock, stopwatch, notepad and task manager. In addition, it features HAC compatibility with hearing aids, although it does not have a screen reader.

Has compatibility for HAC hearing aids. It does not have a screen reader.

## 7.5.    Emotional support solutions

*JoinTalk*

([https://www.orientatech.es/en/jointalk](https://www.orientatech.es/en/jointalk))

Join Talk is an instant messaging application that allows connecting a large number of people who are in exclusion, who suffer from various diseases or other difficulties with others interested in helping them, whether they are caregivers or ordinary people. For these people, the simple fact of receiving support or advice is of vital importance to improve their emotional or social well-being and to help them overcome the difficulties they have.

It is also necessary to point out that there is not a wide variety of applications with these characteristics or functionality. That is why even if it is an only-Spanish app,it is mentioned here with illustrational purposes.

**Functionalities:**

The app is available to download for free on the Android Play Store and the iOS AppStore. However, in order to use the app's service, it is necessary to pay a monthly subscription.
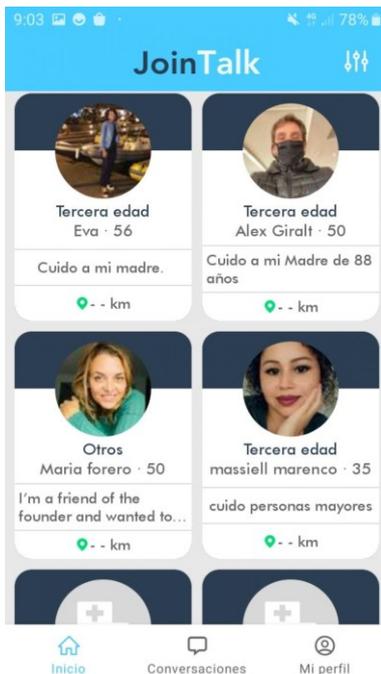
Home screen:

It shows the various users that are part of the app platform, as well as a description of each one.

People who appear can be filtered according to different criteria:

- Type of member, caregiver or patient.

- Gender

- How far from current location.

- Age.

- Motive or reason.

*Figure 68 JoinTalk Home*

Conversations:

This section shows us the different conversations that we have active and gives us the possibility to add friends to members of the application, as well as search for conversations according to the user's name.

*Figure 69 JoinTalk Conversations*



Profile:

It allows to configure the data or options of the profile.

This profile is public for the rest of the people and its correct creation is necessary to improve the experience.

*Figure 70 JoinTalk Profile*

In summary, it is a simple app with a very clear objective, which consists of being an emotional intermediary that facilitates the connection between different people to help each other selflessly. In addition, the app has a simplicity that allows people without great experience or

with difficulties to get along with technologies to easily learn how to use it an it is developed for both IOs and Android so it covers most of the user community platforms.

## Petit Bambou

 ([https://www.orientatech.es/en/petit-bambou](https://www.orientatech.es/en/petit-bambou))

Petit BamBou is a meditation application that can be used to help people, especially older people who use it to reduce stress, calm anxiety or sleep better.

It has an Alexa skill that allows you to start the application by saying the phrase "Alexa, open Petit BamBou" or "Alexa, ask Petit BamBou to do the meditation of the day for me".

It is available for both Android and iOS and has a free version and a full paid version.

**Features**

The app has 4 main features or functions: Meditation, Programs, Sounds and Me. All of them are accessible from a small horizontal menu at the bottom of the screen.
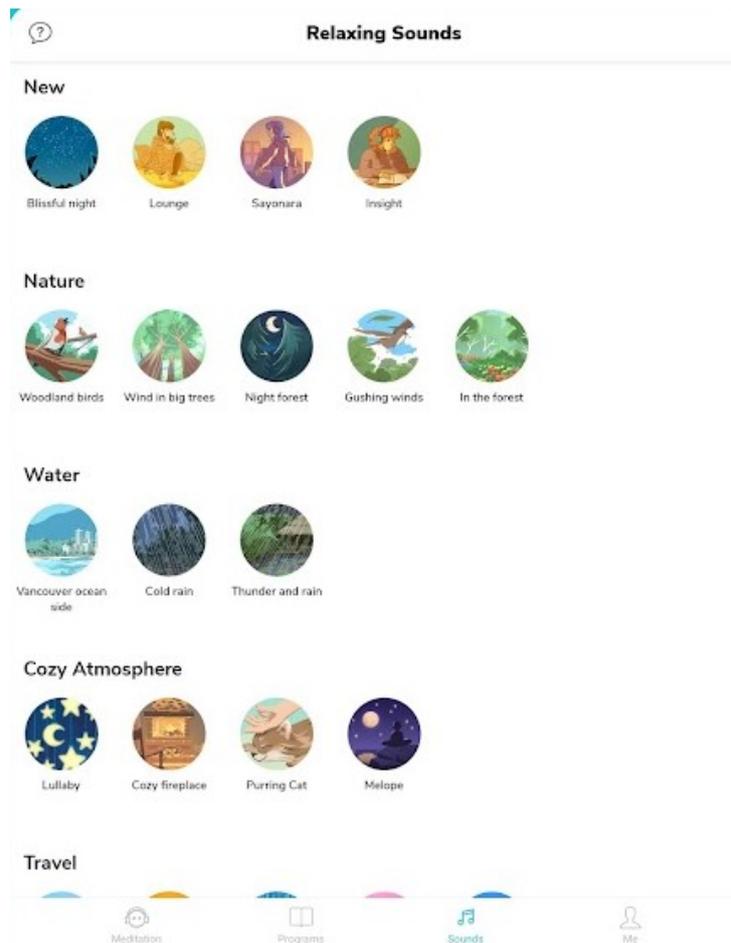
*Figure 71 Petit bambou app caption*

- **Meditation:**

  - **free meditation**, which allows you to configure a personalized meditation session in which you can choose the duration and the start, intermediate and end notices,
  - **guided meditation**, which consists of 8 videos in which a different feature of meditation is treated
  - **3-minute meditation**, whose use is to calm the user if they have just had a moment of stress.

- **Programs:** Different categories are offered here (tools, sleep, progression, mind, body, oneself, work, daily life and health) with different meditations and videos depending on the topic to be addressed. In tools, different functionalities can be used, such as selecting the days and times to set an alarm to remind the user to meditate (in the "My moment" section).

- **Sounds:** In this section different relaxing sounds are provided, which can serve as an accompaniment for meditation sessions.

- **Me:** This section displays user information.

The application has a simple and easy to use interface. It works fine with screen readers like Voice Assistant for Android or Voice Over for iOS.

This app can be used without the need for an internet connection if the meditation sessions are downloaded.

## 7.6.    Cognitive stimulation apps

*Lumosity*

(https://www.orientatech.es/en/Lumosity)

Lumosity is a brain exercise or cognitive stimulation application that allows you to train memory and mental agility, which can be especially useful for the elderly. This application consists of a series of games and tests that will exercise the different areas of the brain.

**Features:**

- Games. This section provides a total of 34 games divided into 6 different sections called work areas: Memory, Attention, Speed, Flexibility, Problem Solving and Mathematics.

- Statistics and the average pressures of the games of each one of the areas are shown.

- Analysis

- Different options such as programming reminders when you want to receive training or change the language.
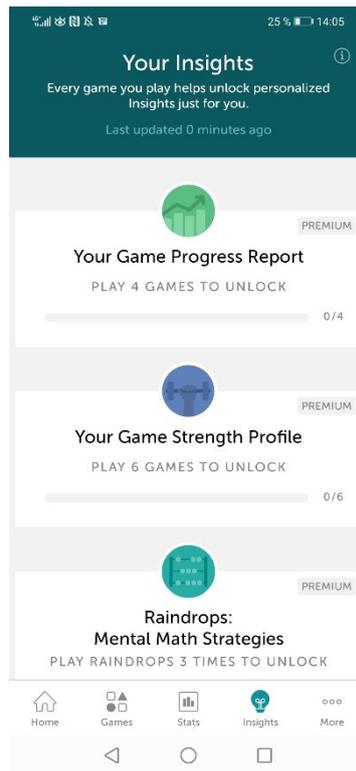
*Figure 72 Lumosity Insight screen*
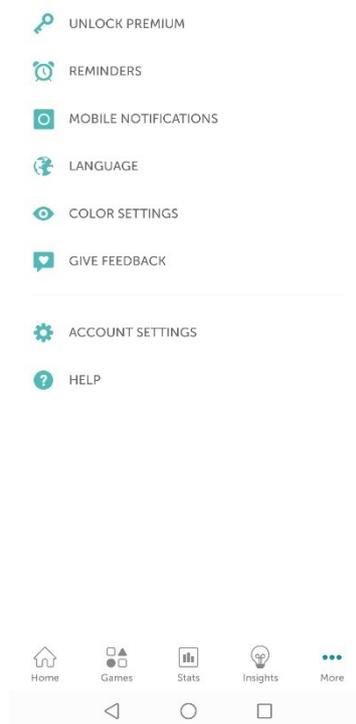


*Figure 73Lumosity settings*

## Neuronation

( https://www.orientatech.es/en/Neuronation )

Neuronation is a brain stimulation application that aims to improve cognitive activities and processes, which can be especially useful for the elderly. It is developed by neuroscientists and is based on 23 categories with various memory and concentration games that adapt to the evolution of the person who handles it.

**Features:**

The application has 4 main features or functions: Session, Extras, Premium, Evaluation and Profile. All of them are accessible from a small horizontal menu at the bottom of the screen.

- Session. Here you can find unlimited sessions, being able to do as many as you want during the day.



*Figure 74 Neuronation Session*

- Additional features. In this section, the application offers a total of 11 activities that help clear the mind.

*Figure 75 Neuronation Activities*

- Premium. Here you can see the prices of the premium version.

- Evaluation. In this section, 4 different bar graphs are shown, each of them is intended to show the capacity, by means of a percentage, that the user has in each of these categories (Speed, Reasoning, Attention and Memory).

*Figure 76 Neuronation evaluation*

## *Cognifit*

 ([https://www.orientatech.es/en/cognifit](https://www.orientatech.es/en/cognifit))

Cognifit is a brain fitness and cognitive stimulation app that allows you to assess and train your memory and mental agility. It stimulates the user's cognitive abilities with mental challenges, thinking games, puzzles, brain teasers, and educational games.

Cognifit is intended to carry out an evaluation prior to that of a specialist and help care for the cognitive health of healthy users and stimulate or rehabilitate brain function in people suffering from cognitive impairment. In addition, this app adapts to the cognitive needs of the user, whether they are children, adults or the elderly.

The app can be downloaded for free on the Play Store and the App Store. However, in order to enjoy all the content Cognifit offers, you need to pay for a subscription.

**Features:**

- Train: This section makes available to the user up to a total of 20 related trainings on very varied topics, such as training for mental calculation or concentration. Each session of these trainings consists of two games and an evaluation task. In addition, in this section we can also find tutorial videos made by a trainer.
  To access all these trainings, it is necessary to be paying the subscription plan.



*Figure 77 Cognifit Train feature*

- Assess: This section provides up to 10 assessment methods related to different forms of cognitive impairment, such as dyslexia, Parkinson's, etc.

  These evaluation methods aim to obtain a detailed measurement of the user's cognitive abilities and calculate a risk index for the most common mental disorders. To access all the evaluations, it is necessary to be subscribed, with the exception of the general cognitive evaluation which can be accessed for free.
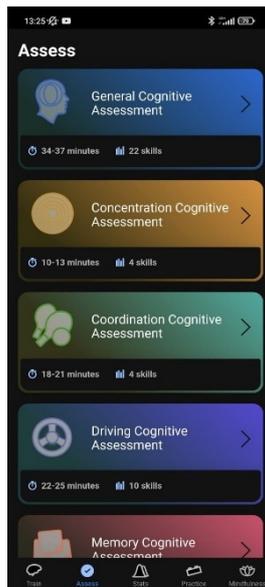
*Figure 78 Cognifit Assess Feature*

- Stats: It shows the user's progress through a graph that contains the scores obtained in the training sessions. This graph only shows the data after performing any of the evaluations in the "Evaluate" section.
In addition, this section provides personalized brain training for free that can be done once a day and that consists of three of the four games that the app makes available to the user for free.
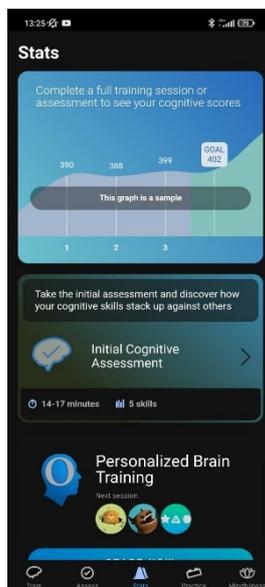


*Figure 79 Cognifit Stats*

- Practice: It offers the user the possibility of trying a total of 28 games, which are the ones used by the application itself to carry out training and evaluations. Of these 28 games only four are available for free.

In addition, the different games are accompanied by a mini tutorial designed to guide the user.



*Figure 80 Cognifit Practice*



*Figure 81 Cognifit Practice example*

- Mindfulness: This section is dedicated to introducing users to Mindfulnes thanks to a first introductory video followed by different sections dedicated to specific sections. Among the different sections we find guides on meditation or falling asleep.

*Figure 82 Cognifit Mindfullness*

In general terms, this application can greatly contribute to older people keeping their minds active, Cognifit is one of the most complete applications that can be found on the market, since it deals with up to 20 forms of cognitive impairment, helping the user to identify if they are at risk of suffering it or to try to minimize its impact if they already have it.

## Memorado

([https://www.orientatech.es/en/memorado](https://www.orientatech.es/en/memorado))

Memorado is a brain gymnastics or cognitive stimulation application that allows you to train memory and mental agility. This app consists of a series of games and tests that will exercise the different areas of the brain. In addition to these games the application also provides a series of audio sessions that can help users to calm their mind.

The app can be downloaded for free on the Play Store and the App Store. However, the app has a paid subscription that considerably increases the functionalities and features of the application.

When starting the application for the first time, it asks us for age, gender and other aspects to know what the needs of the person who is going to use the application are. Once everything has been answered, the application recommends us to carry out a tutorial to complement our data and guide us.

**Features:**

- Mentor: This is the section that is displayed every time the application starts. There are three sections in it:

    o New training. Each time it is launched, the app will provide a workout with five of the available games.

    o Audio of the day. Three meditation programs are provided in this section: Rest, Fantasy Stories and Nature Sounds. These programs have a total of 41 meditation sessions that are divided among them.
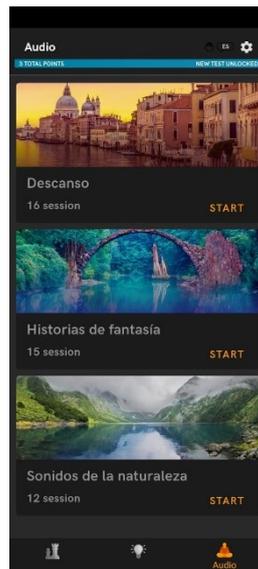


*Figure 83 Memorado Audio feature*

    o Game of the day. Provides the user with a total of 14 games divided into 6 different sections: Concentration, Memory, Speed, Reaction and Logic. The free version of the app will provide a limited number of the available games.
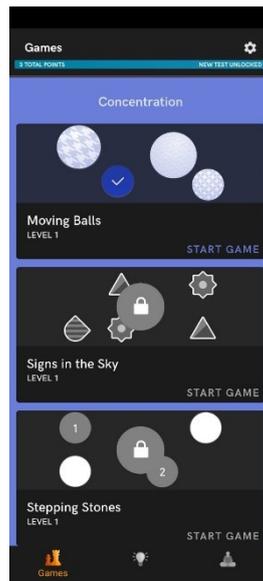
*Figure 84 Memorado Games feature*

## 7.7.    Medication adherence apps

*Calendula*

([https://www.orientatech.es/en/calendula-app-gestion-medicacion](https://www.orientatech.es/en/calendula-app-gestion-medicacion))

Calendula is a simple but very intuitive application that allows to manage the medication of several patients at the same time, each one with their own medications, guidelines and reminders.

Each patient is differentiated by name and can be chosen from pre-established images. This possibility is very practical for caregivers and family members who can manage their own medication and / or the medication of the people they care for. A small improvement in this aspect is that the photo of the patient's profile could be chosen instead of having to choose between the already established images.
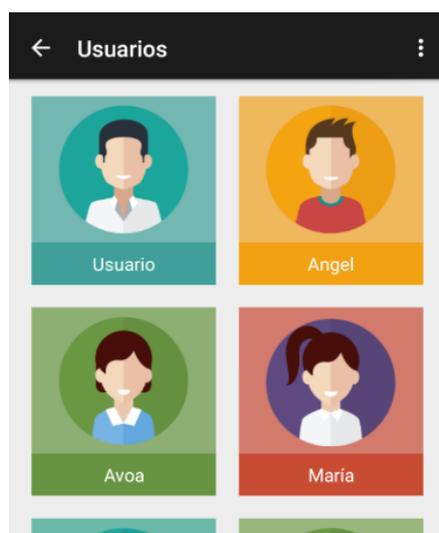


*Figure 85 Calendula patient list*

The main feature of the application are the reminders to notify us of taking medication. It is precisely this time to add a reminder that is somewhat confusing and it can take a while to become familiar with the terms of shots, guidelines, routines and how they interrelate. Once this point is saved, the notices are clear and allow a very wide customization.

*Figure 86 Calendula reminder panel*



*Figure 87 Calendula reminder at home screen*

## Medisafe

([https://www.orientatech.es/en/medisafe](https://www.orientatech.es/en/medisafe))

Medisafe is an application that offers medication takes tracking, alert sending when medication is not taken, reminder and calendar management, it is also a PHR solution and includes an easy way to send reports safely to personal trust contacts. An Internet connection is not required for its correct operation, the application is available in multiple languages and offers the possibility of having 2 profiles in the free version and multiple profiles in the premium version.

**Features:**

- It allows to add and identify medicines with the prospects included, frequency, and takes. It also gives the option to quickly diferenciate them according to their shape and color thanks to the wide variety of icons available for medicines.



*Figure 88 Medisafe medication search caption*



*Figure 89 Medisafe medication taking method selection*
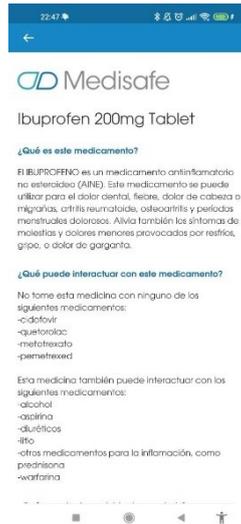
*Figure 90 Medisafe prospect example*

- It allows to record and track the doses taken and not taken. In addition to managing reminders at different times, intervals and frequencies.

- It allows monitoring of health problems or discomforts such as headaches, drowsiness, etc. and view graphs on our progress. This PHR solution includes other record noting methods and formats such as:

  o **Custom Notes**
  o **Appointments:** In this section we can add our medical appointments, in which we can associate said appointment with a doctor that we have registered in our list of doctors within the Medisafe app. In addition, we can link other reminders, notes or location with our appointment.
  o **Doctors**: In this section we can add our doctors, entering data such as the name of our doctor, their specialty, their email address, their address, their contact numbers, for example, their work or personal phone number. In addition, we can select an avatar that represents our doctor.

  o **Refills:** In this section we will find a history of the times we have refilled our medications.

  o **Report:** This section allows us to set up a report about a drug or all of our drugs. The report is a document in PDF format with the option to export it to Excel, which contains information about the doses that we have taken or that we have missed. This report can be daily, weekly, monthly or yearly and we can send it to our doctors, relatives or trusted people through WhatsApp, Gmail, among other applications.

*Figure 91 Medisafe PHR question planification screen*



*Figure 92 Medisafe DashBoard*

- It allows interaction with smart watches so that notices are received on the watch.

- Option to alert other people when to take their medications or when missed doses are recorded

## *MyTherapy*



(https://www.orientatech.es/en/aplicacion-mytherapy)

MyTherapy allows you to configure personalized alarms for each medication that the user takes, assigning them the dose and the time, with the frequency corresponding to each one of them. In addition, it allows you to monitor the treatment in which it is indicated whether or not the medicine has been taken at the established time, and allows you to share this

information with family members and your doctor This PHR and medication adherence app combines a pill log, mood tracker and health diary, among others.

**Features:**

- **Medication reminder:**

  Pill alarm, complete database of prescription or non-prescription medicine, support for different types of doses (tablet, pill, inhaler) and reminder to recharge your medication. As the app is not just a pill alarm but also a medication log, you just need to review your pill diary to make sure you have taken the correct dose.



*Figure 93 MyTherapy add medication by barcode scan*

- Pill control with log journal for missed and confirmed intakes.



*Figure 94 Log journal*

- Medicines alarm with different types of shots or doses.

- Track tablets, doses, measures, activities with a health journal.

- Measurements such as weight, blood pressure, blood sugar level, etc., for all conditions (diabetes, rheumatoid arthritis, anxiety, depression, hypertension, multiple sclerosis).
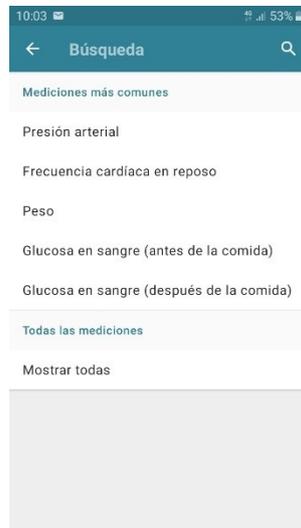


*Figure 95 MyTherapy measurements screen*

- Shared data with other contacts for your motivation and health.

- Printable health journal to share with your doctor.

Receive one photo per day as motivation to take your treatment. Involve your family and friends with Function Team and manage your treatment together. Your family will see if you have missed a dose despite the pill alarm and help you continue your treatment.



*Figure 96 MyTherapy PHR*

# 7.8.  Tracking, GPS-based and alarm apps

*Life 360*

(https://www.orientatech.es/en/aplicacion-localizacion-life-360)

Life360 is an application for Android and IOS Smartphone that offers a family location service based mainly on GPS technology.

Life360 incorporates Circles, which are groups for friends or family. Some may be just communication channels, while others may use all location features. The characteristics and preferences are specific to each Circle.

**Features:**

- **Location on the map:** One of the main functionalities of the application is to share the GPS position of each member of the circle on the map.
  The location on the map works with reasonable precision and the display on the map of these positions with their different configurable views is useful and stylized. In a simple glance you can check the positions of the different members of the circle on the map and check their movement in real time.
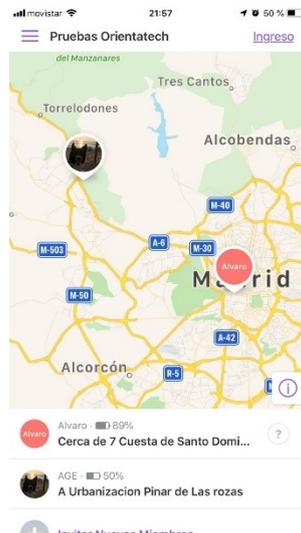


*Figure 97 Life 360 location map*

- **Places:** Are selectable points on the map that allow you to trigger automatic notifications if you enter or leave them.

- **Messages:** The application has a very functional chat for circles that has a high availability that is at the level of the best messaging applications such as WhatsApp or Facebook. The chat allows the sharing of images in real time.

- **Panic button:** The panic button is used to communicate an emergency to the members of the circle, there is also the possibility of communicating an emergency to 112 or the national emergency telephone number.
Members of a Premium Circle will receive an email notification, in-app notification, and a text of their current location, plus a phone call advising them that you need help. However, if you are part of a non-Premium circle, each member will receive an email and an in-app notification letting them know that you need help.



*Figure 98 Life 360 panic button feature*

## SMS Samsung alert

 ([http://www.orientatech.es/en/sms-alerta-samsung](http://www.orientatech.es/en/sms-alerta-samsung))

The latest Samsung phone models include a functionality built into their Android operating system that allows instant notification of emergency situations to trusted contacts.

This system has been present since the S6 model with Android versions from 6.0, and has continued its success being included in all new models such as S7, S8, S9 and other families such as the J series.

This functionality is a recommended option for everyone who has a current version of a Samsung terminal.

This functionality allows us to send an SMS to one or more previously selected trusted contacts in case of an emergency situation.
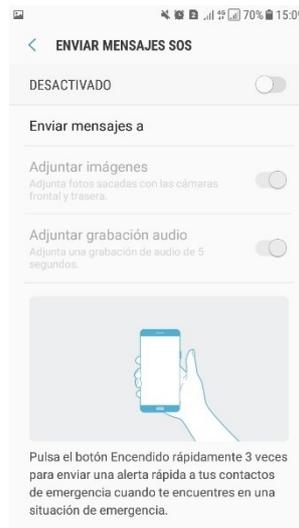


*Figure 99 Samsung SMS S.O.S*

You can activate the option of sending photos taken with the front and rear cameras at the moment of pressing the button and an audio recording of the microphone lasting 5 seconds.

The message received by the contact person includes a link to the position referenced in google maps. Likewise, the emergency activation time is included.

The alert message is activated by pressing the terminal's power button 3 times relatively quickly.



*Figure 100 Samsung SMS S.O.S message*

Once pressed, a pop-up message appears in the phone's notification menu indicating that the message is being sent. This process may take a few seconds if the option to attach photos and audio from the moment of the click has been included.

The message is sent to the contact phone in SMS format and the attached information such as photos and audio is sent in MMS format.

NOTE: It is important to bear in mind that MMS messages related to images and audios usually have an additional cost that in some cases can be high.

The position is referenced through a link to google maps in the SMS itself received by the contact person. Taking into account the GPS precision of current Samsung models, this data is of high quality when it comes to geo-locating the emergency point.



Figure 101 Samsung SMS S.O.S Location view

## Durcal

 ([https://www.orientatech.es/en/durcal-app](https://www.orientatech.es/en/durcal-app))

Durcal is a control or monitoring application, focused especially for the group of elderly people and families, so that they can be more autonomous and are safe with their monitoring by their relatives, as well as facilitating the approach to them through of the use of new technologies.

**Features:**

- **View selection:** With the app started, we can choose different views, if we are elderly or caregivers, it depends on the selected option we will have different options available:

   - Normal view: if we select the option, our contacts that we have on the device will be opened to us so that we can select our elders and begin to control or obtain

information about them, the rest of the options or elements of the interface will appear at the bottom grouped in a vertical bar.

- Adapted View: it will show us a reduced interface in which we can request photos or videos from our relatives that we have as contacts.
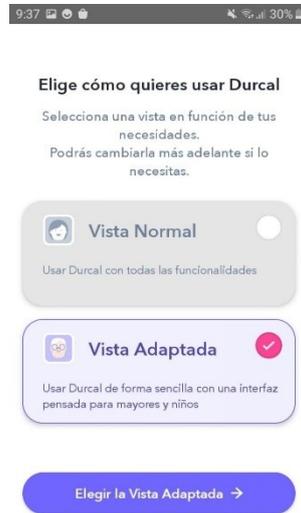


*Figure 102 Durcal view selection*

- **Map:** shows the location of the elderly people that we have added on the map and our location.

- **Family:** allows us to see information on the status of the telephone device of our elders, as well as send them photos, videos, see our relatives, etc ...



*Figure 103 Durcal family view*

- **Activity:** shows us information about the physical activity carried out by the elderly that we have added, such as, for example, steps they have taken during the day, if they have met the daily exercise goals, etc ... As well as our activity or the published photos.

- **Services:** shows us a catalog of residences for the elderly near our location and their contact information.

- **Places:** It allows us to add addresses of our house, neighborhood, residence and work, being very useful in case an elderly person gets lost, for example, since they could easily locate their place of residence, thanks to this information , in addition to allowing you to add custom places.



*Figure 104 Durcal Places*

# 8. Conclusions

Throughout this interactive document, a taxonomy has been described to categorize and structure the different technologies, the lines of innovation and the state of the art of current technology have been explained, and finally a compilation of technologies that could be useful for to the European project Housing care has been made. Many links and references have been included within the text information so it can be easily accessed and expanded as needed.

All this has been structured and done with the purpose of meeting the objectives but also to emphasize the fact that in order to have a greater probability of causing a real and greater impact on society, the best bet is to find the balance between innovative and mature solutions as explained in the General lines and Trends' section with the hype cycle figure.

In order to influence the target population, an attempt has been made to choose and identify simple and intuitive solutions that provide the greatest amount of value according to the identified needs, in addition, always considering the great impact that the COVID-19 pandemic has on today's society and especially the loneliness that can cause in the elderly and the aggravating conditions for caregivers.

In this document, some solutions have been described that in many cases would not be the ideal ones for the context or the organization in which they will be finally applied to, in this sense, the objective of the information presented here is to serve as a guide, expose the existence and realistic capabilities of each technology and its main strengths so that in the future, informed decisions can be made that are appropriate to the casuistry and the real environment.

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