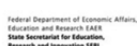**AAL Joint Programme**

HOME-based ICT solutions FOR the independent living
of people with DEMentia and their caregivers

D4.1 – State of the art of available technologies and Market analysis for the Home4Dem system

Project acronym:		Home4Dem	
Project name:		HOME-based ICT solutions FOR the independent living of people with DEMentia and their caregivers	
Call:		AAL call 7 2014	
Contract no.:		AAL JP reference: AAL 2014-1-041	
Project Duration:		01-09-2015 28-02-208 (30months)	
Co-ordinator:	1	National Institute of Health and Science on Aging (IRCCS-INRCA)	INRCA
Partners in the project:	2	ArieLAB Srl	ARIELAB
	3	i-Home Lab	i-Home
	4	University of Lund	ULUND
	5	Eichenberger-Szenografie	EIS
	6	DOMO SAFETY	DOMO
	7	Trelleborg Kommunen	TREL
	8	Karde AS	KARDE
	9	AUTOMA Srl	AUTOMA
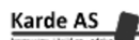
Home4Dem

HOME-based ICT solutions FOR the independent living of people with DEMentia and their caregivers

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PP	Restricted to other programme participants (including the Commission Services)	
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CO	Confidential, only for members of the consortium (including the Commission Services)	

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Acronyms

6LoWPAN	IPv6 over Low power Wireless Personal Area Networks
AD	Alzheimer's Disease
ADLs	Activities of Daily Living
B2B	Business to Business
B2C	Business to Consumer
CAT-cables	Category x cable, standardized cable for Gigabit Ethernet
CHF	Swiss Franc
CoAP	Constrained Application Protocol: a specialized web transfer protocol
DECT	Digital Enhanced Cordless Telecommunication
ED	Emergency Department
EPR	Electronic Patient Record
GP	General practitioner
GPRS	General packet radio service: a packet oriented mobile data service on the cellular communication system's
GPS	*Global Positioning System*
HCE	Health care expenditure
HVAC systems	Heating, ventilation, and air conditioning
IA	Indennità di Accompagnamento: in Italy cash allowance offered by the state to the family
IADLs	Instrumental Activities of Daily Living
ICT	Information and communications technology
IEEE	Institute of Electrical and Electronics Engineers
IIC	Industrial Internet Consortium
IP	*Internet Protocol*
IPv6	Internet Protocol Version 6
ISM-band	Industrial, Scientific and Medical *band*: A part of the radio spectrum that can be used for any purpose without a license
KNX	KONNEX: an industrial standard in Home automation
LED	*Light Emitting Diode*
LTC	Long Term Care
MIUR	Italian Ministry of research
NAV	Norwegian Labour and Welfare Administration
NHS	National Health Service
NOK	Norwegian Krone
OIC	Open Interconnect Consortium
PWD	Person With Dementia
RF	Radio Frequency
RFID	Radio-Frequency IDentification
RJ	Registered Jack: a kind of physical cable connector
SCART	Syndicat des Constructeurs d'Appareils Radiorécepteurs et Téléviseurs: a standard 21-pin connector for connecting audio-visual (AV) equipment
SEK	Swedish Krona
USB	Universal Serial Bus
WHO	World Health Organization
WLAN	*Wireless local area network*

Executive summary

Objective of this document is to present the environment analysis preliminary to the development of the marketing strategy for the Home4Dem project.

The document is structured in 3 parts:

- review of the current state of the art technologies in related to the objective of Home4Dem

- analyse the factors that will influence the potential market in the 4 countries participating to the project (Italy, Norway, Switzerland and Sweden) identifying demographic, sociological, economic, and technological drivers

- identify the products already available on the market in the four countries that will be potential competitor or in a synergic view partners for in market strategies.

The information collected are finalized to the development of "Preliminary business plan for the Home4Dem system" in deliverable 4.3 expected at the first year of the project.

1. <u>Introduction</u>

1.1 Mission

To develop a marketing strategy for the Home4Dem project in 4 countries (Italy, Norway, Switzerland and Sweden).

1.2 Objectives

- To Review the current state of the art technologies and existing service model
- To survey the integration between products and services
- To conduct market analysis

1.3 Limitation

The research has been focused only on 4 countries and therefore the geographical coverage of this report will be limited.

2. State of the art

In order to consider the state of the art in the field of monitoring systems and assistive technologies for people with dementia, one has to start with a short overview of the existing smart home systems as there are dozens of such products available today. The current hype of home automation technologies has been fostered by both small start-ups [1][2] and some of the biggest ICT companies (Google, Apple and Samsung) [3][4][5][6], and in the next future it can be expected that many more solutions will penetrate the market. Many of these solutions could act as a basis for new home monitoring systems that would potentially bring benefits to elderly people living at home, including persons at different stages of dementia.

Overview of the home and building automation sector

The **classical home and building automation applications** focus on increasing the comfort, security and energy efficiency in residential homes and commercial buildings. Whereas, at least in Europe, the vast majority of the installed automation control systems are still applied to commercial building scenarios. They mainly control the lighting, the shading and the HVAC systems [7][8][9] in offices and industrial buildings. Another important branch is dedicated to ensure **safety in the building** focusing on detecting fires and other natural hazards, as well controlling physical building access and detecting intrusions[10][11][12]. In parallel, **multimedia solutions** are on the market, seamlessly integrating and controlling different input and output modalities in order to present audio-visual content on demand in different applications scenarios (meetings, events, etc.) [13][14][15]. These are often interconnected and work together with the automation systems.

The **applications in the smart homes** are quite similar to the ones in the commercial buildings except that the number of sensors and actors is generally smaller and the requirements of the end-users in terms of usability, maintainability, flexibility, pricing and reliability may vary depending on the scenario. While some of the existing providers of smart home systems provide complete solutions from a single source [16][17], other companies focus on single applications with open interfaces that can be integrated easily with other systems [18][19][20][21].

In terms of type of **sensors**, commercial building systems as well as smart home applications mostly rely on well-known components such as door and window contacts, motion and presence sensors, smoke and fire detectors, environmental sensors (temperature, humidity, CO_2, brightness), water leak sensors, RFID or fingerprint readers, electricity meters, cameras etc.

One important parameter to characterize building automations systems is the **communication technology** applied. The commercial applications and earlier solutions of smart home technologies mostly relied on physical cabling as medium to transport their information. These cables may belong to dedicated fieldbuses [22][23], be standard CAT-cables [24] or also use the existing power wires (Powerline communication) [22][25][26][1].

With the rapid development of wireless sensors networking technologies more and more systems tend to use **radio frequency** – mostly the freely available ISM-band – to communicate. This is especially valuable in home settings where the environment needs to be rapidly and easily refurbished with new technology components. This is actually the standard case in AAL scenarios where almost all the houses are not prepared for such systems and nobody thought about them during the planning and construction phase.

- Besides the many **existing proprietary RF** technologies [27][28] - some of which also tailored for special applications such as working very energy efficiently [29], new standards aroused based on **mesh network technologies** that are extending the range and are self-healing in case

a node fails. The **ZigBee standard** has become quite broad in its range of applications supported also including health care, smart energy, retail, remote control etc. [30]. However, this approach didn't foster the compatibility between the different so-called ZigBee application profiles and among the different providers of ZigBee solutions, which is one of the reasons why the technology has not been as widely adopted in the smart home domain (in Europe) as initially expected.

- Other wireless technologies such as **Z-Wave** [31] start to participate to the development of smart home applications and formed consortiums creating products that have become quite popular in Europe and the USA [32][33]. However, one of the main drawbacks of this explicit technology is that it is controlled by a single company which also holds the patents and the monopoly in licensing the RF-chip technology [34].

- Other well-established RF protocols from other consumer segments are trying to get a share of the hard fought smart home market: **Gigaset** produced a smart home system based on DECT the de-facto standard for wireless land-line phones [35][36]. The **Bluetooth Alliance** announced that they will extend the existing Bluetooth Low Energy standards in order to support the mesh networking capabilities needed for smart home applications [37].

At the moment the trend of integrating billions of sensors in the so called "**Internet of Things**" introduces a big shift towards **IP-compatible wireless sensor technologies** based on IPv6, 6LoWPAN and CoAP [38][39]. This shift is backed by new consortiums and standardisation groups that have been formed in the last two years involving many big ICT companies. One of the main drivers or them is the smart home. The most important initiatives are called Thread [40], AllSeen [41], Open Interconnect Consortium (OIC) [42], the Industrial Internet Consortium (IIC) [43], and the Institute of Electrical and Electronics Engineers (IEEE) P2413 [44].

Another aspect to be considered is the "**smartness**" with which smart home systems analyse the incoming sensor data and take the decisions to achieve their goals. Most of the traditional systems work on static rules in the form of "if-this-then-that". Those rules are manually entered by a system engineer, are quite simply designed and result in a fixed decision taking often leading to a system behaviour the user neither expects nor wishes. What's more, most of the systems only rely on the data of single sensors without taking into account the values of the other sensors installed in the building that might be helpful in certain situations (**sensor fusion**). They also don't utilize **other valuable existing data sources** such as calendar information. And finally, they do not **observe and learn** from the actions and the behaviours of the users themselves. There are systems and projects around that – more or less sophisticated – use machine learning techniques, combine different data sources and take the user feedback into account to adapt to the context of the user and his environment [45][3][46].

Focus on the AAL sector

After this short overview of home and building automation systems, a closer look shall be taken to assistive solutions for the elderly people living at home or in care institutions, being often frail and/or suffering from different stages of cognitive decline. There is a need to distinguish between:

- integrated solutions vs. solutions looking at single specific aspects.
- systems that act preventively and try to predict potentially harmful incidents vs. systems that detect either short-term emergencies (e.g. a fall) or long-term trends (e.g. changing of eating behaviours)

Today, most of the application have been focusing on the immediate need, i.e. the **detection of an emergency situation**. This is partly the reason why there are several emergency calling systems around. Some of them are designed for indoor use [47][48], while others also operate in outdoor environments [49][50]. Most of the commercially available solutions work with a worn sensor, in the form of a more or less aesthetically designed armband or necklace with an emergency button that needs to pressed to call for help. Many vendors offer additional equipment to raise alarms in form of fixed buttons, or pull strings that can be installed e.g. in the bathroom. As for the worn sensors, a few manufacturers created especially dedicated watches [50] or use apps on mobile devices and smart watches [51][52] to provide the emergency calling feature. Usually, these solutions are distributed, supported and operated by end user organisations such as the Red Cross [53] or a telecom operator such as Swisscom [54] providing special subscription plans either just involving freely programming phone numbers of family carers and/or a setup with a professional emergency calling center. One of the issues of these systems is that, except for the fall sensor that is described in the next section, the alarm usually needs to be raised manually by actively pressing the emergency button or pulling on a string. If this is not feasible for some reason, e.g. because the person is unconscious or does not wear or cannot reach the button, the emergency situation is not automatically detected and no alarm rose. A possible extension is the installation of a kind of "in-activity" sensor which, after a while, detects that nobody is moving around the apartment and may initiate a warning issued to one of the family carers [55][56] (see also monitoring systems below).

As **falls** are among the most dangerous domestic accidents and in many cases the most influential factor associated with the decision to move into a nursery home, special "fall sensors" have been developed as an extension for the available emergency calling systems [47][48][57][58]. Most of them also need to be worn, which is often considered a drawback, as people tend not to wear the sensor in the moment they fall due to comfort and stigmatisation reasons or simply because they temporarily don't wear after taking a shower.

The existing systems operate more or less reliably in regard to the **false alarms** they produce. A large number of research projects have dedicated their work to detecting falls inventing new kinds of detection methods e.g. using cameras [59][60], the Kinect sensor [61], microphones [62] or special sensory flooring [63]. Others concentrated on the algorithms for falls detection and e.g. implemented and tested them in apps on mobile devices using the available (acceleration-)sensors [64][65]. Detecting falls reliably still is a somewhat unsatisfactory solved problem and an ongoing research topic. An own branch of research is the potential prediction of a fall e.g. by using **gait analysis techniques** which closely observe the way people walk and recognise trends and typical characteristics that show in people with a high risk of falling [66].Other works focus on **games and training programs** to improve people's strength, stamina and physical coordination abilities in order to prevent falls in the first place [67].

Especially for people with cognitive memory problems solutions have been developed to **automatically turn off potentially hazardous electrical devices** such as a running oven [68][69]. Another group of solutions that is already on the is dealing with area access control and location solutions which h were initially developed for professional institutions working with people with dementia. To this group of solutions belong the RFID-based systems and other active and passive sensing equipments to assess when people are entering areas and rooms in the building with granted access [70][71]. Some of these systems observe and track the paths the people walk to raise warnings or alarms in case anomalies are detected. Such solutions exist for people moving indoors [70] based on RFID or indoor localisation technologies working on the WLAN [72] or Bluetooth iBeacon basis [73]. Bluetooth low energy based modules are also often used to tag things such as keys and glasses in order to find them if they got lost. Usually a mobile phone and the matching app are used to roughly

localise the lost item, which works indoors or outdoors. As the localisation is not very precise the tags start making a sound if one is near them [74][76][75]. Some of the AAL projects included those tags into their feature set to provide the "lost things" feature over their interface [64]. Besides the products mentioned, low-power, low-cost and high-precision indoor localization systems are still under research [77].

More common are the various localisation and tracking systems which exist for outdoor applications using **GPS technology** [78][70][49]. They provide the means to localize a missing person outside or raise alarms automatically using geo-fencing functionalities which allow for the supervision of pre-defined outside areas that must not be left or entered by an individual. Besides dedicated hardware using GPS bracelets to be attached on arms and legs there are a few AAL projects but also available products that provide this kind of feature in form of a mobile app [79][80][52]. These tools work fine but one must make sure that the mobile devices are not forgotten at home and still have enough power to work properly in the situations they are needed most. Both situations can be detected and family care givers at least get warned on their occurrence.

One of the most active research fields in AAL deals with **activity recognition and behaviour prediction**. The basic idea behind this kind of systems is that the data of a set of sensors, which are installed in the home of the elderly still living at home, is analysed smartly in order to find out what the person is or has been doing and detect abnormal situations, emergencies or long-term trends in order to generate the information needed by informal or formal carers and to give them the chance to timely react with the proper counter (care)-measures Most of the projects focused on the activity recognition algorithms used off-the-shelf smart home sensing technology such as magnet sensors for doors and windows and presence detectors to acquire the data needed [81][82]. Sometimes, additional sensors such as pressure based bed sensors or floor mats are utilized. Many of these studies concentrated on detecting the so called ADLs and IADLs ((instrumental) activities of daily living) which describe everyday activities such as cooking, cleaning, managing medication and financial issues but also deal with very basic tasks such as walking, dressing, eating, personal hygiene etc. that directly relate to the level of dependency of the older person [83][84][85][86]. Others have addressed the detection of more complex "health or well-being status", related to the notion of Quality of Life [81][82][87][88][89][90][91]. However, it turned out to be quite ambitious both to find a common definition of such a status and to reliably detect it. Some of the projects dedicated their monitoring to detect the symptoms of dementia [92][93][94] such as wandering [63], depression [95], memory loss **[96]** [97], counting toilet visits (incontinence) or especially focusing on the sleep patterns and the behaviour during the night, as people tend to lose their day-night rhythms with the progress of the desease [96][98]. Few projects develop solutions that went beyond the passive monitoring activities and implemented automatic responses, such as changes of the intensity and colour of the home lightning using chrono-biological light controls with the aim to normalise the people sleep and shift day-night rhythms back to normal [99]. Light can also be used to actively guide and "control" the movements of people with dementia as they there have been works that showed that people actually will "follow the light" and avoid dark spots.

In the meantime, products using **monitoring principles** have been introduced to the market in Europe and the USA [100][101][102][86]**[103]**. These products usually also integrate common safety features such as a smoke detector or e-Health aspects e.g. using a connected scale. Special sensing systems have been developed to support the formal carers in institutional elderly care [104] which involve the monitoring of vital signs such as the pulse or the heart rate variability in order to detect stress and related symptoms [105][106] or even actively react on them e.g. to prevent pressures sores [104].

A new way of combining (domestic) monitoring technology with **life style** and l**ow barrier communication capabilities** is taken in the AAL project RelaxedCare by introducing a physical object

on both the elderly home and the family caregiver to create a link between them [81]. The basic idea behind the application is that not only the observer (caregiver) receive information about the conditions of the elderly but also vice-versa. This change of paradigm is important as it reduces a bit of the "big brother" idea connected with this kind of monitoring approach. As what regards the privacy issue, besides the sensor-based solutions (which are working more or less unobtrusively in the background), there are more **invasive methods** such e.g. using cameras to observe the person at home using image processing algorithms and live video streams [107]. A product that is already quite well established, but has not been designed specifically for elderly people is the NetAtmo camera which is able to detect persons and their faces quite reliably and act accordingly [21]. However, many people refuse cameras in their homes or monitoring at all and therefore a lot of research has been conducted relating to the ethical aspects of monitoring solutions with and without cameras [108][109][110][111]. Studies have been conducted with the aim to prove the effectiveness, the true value to the different stakeholders and the achievable cost savings of such monitoring systems. These factors at the end heavily influence the acceptance, the massive distribution and the economic success of these solutions on the market.

Another group of camera and microphone based systems are the well-known solutions providing **video communication functionalities,** implemented on PCs, tablets, smartphones, set-top boxes or on the smartTV directly (Skype, Facetime & Co.). Some of them explicitly focus on the communication between elderly people or people with dementia and their informal carers [112]. Such systems may be used just as a mean of keeping the persons socially engaged with family and friends but also – classical e-health use case – to provide tele-care and tele-consultations services involving health professionals.

In regards to many topics such as **e-inclusion and solutions to prevent isolation** at home by still keeping ones' independence, several calls of the AAL program [113] have been dedicated to self-care approaches, mobility solutions and systems that provide special forums, social networks or interactive and community based games, quizzes and training programs for elderly people to stay physically active and fit, cognitively trained and socially connected. Many of them explicitly included people with (mild) cognitive impairments [114][115][116][117][118][119]. Some projects dealt with bringing multimedia easily to the people empowering them to watch pictures and movies or listen to the music and the radio programs they like [97][120]. These kinds of functionalities may also be of use for people with dementia to calm them down or remind them of things they used to like in former days.

A range of AAL projects actually focused on the target group of **informal carers** and on the task of supporting them with tools e.g. to connect them to other informal carers and health professionals to form a caring community that collaborates together in order to care for someone. As such, they help managing the care process, creating care plans and organising, sharing and assigning the identified tasks among the parties involved [121]. Some of them go further and provide the informal carers with **special training programs and psychological support** in order to reduce their burden [122][123][124]. Some initiatives went beyond their single EU projects and formed information and collaboration platforms for European carers on the "Eurocarers" site [125][126]. The quality of sleep of the informal carers as well has been an issue under research [127].

In general, AAL systems for people with dementia should be designed in a way that they **work unobtrusively** in the background implicitly interacting with the user. However, sometimes **explicit user interaction is inevitable or even wished**. In this case, there studies and projects dedicated to the design of user interfaces for people at different stages of dementia. The results range from simple guidelines for static design issues such as colours, contrast, font sizes, number and characteristics of the UI controls, to the design of platforms to seamlessly and dynamically integrate different input and output modalities based on the user preferences [128], and to sophisticated adaptive user interfaces that context-sensitively "grow" or rather "shrink" together with the vanishing capabilities of their users

[52]. Some project experiment with **avatars and speech interfaces** [64][128] as a means of control, others use gesture control or augmented reality [129]. Few vendors concentrated on developing special mobile devices for elderly [130][131].

Many AAL projects and existing products provide shared calendars and reminders for appointments or to tell people to take their medication (including dispenser devices) or drink a glass of water [64][52][121][88]. Some of them include daily task lists and diaries that support people in keeping up their daily routines and bring them back into their memory the things they have done earlier this day, week or month [64][132].

PAUL [120] as a product available on the market and DALIA [64] as an ongoing AAL projects are solutions that seek to deliver a "whole in one solution" including different pluggable modules providing calendar, communication, multimedia, home automation and much more. Another approach is that of the EU project UniversAAL [133]**Errore. L'origine riferimento non è stata trovata.** with the aim to develop an open and "universal" middleware platform and reference specification for AAL applications that e.g. easily allows it to integrate new sensors and other hardware using plug'n'play mechanisms and semantic descriptions.

3. Environment Analysis

3.1 Italy

3.1.1 Demographic and Sociological Drivers

Ageing Population

The total population of Italy was 60,795,612 on 1 January 2015[134].

Population by age:

- Number of people aged 20-64:   36,329,48   (59.8 %)
- Number of people aged 65-79:   9,241,625   (15.2 %)
- Number of people aged 80 or over: 3,977,449   (6.5 %)

Ageing trend

Italy already shows a very high and further increasing population ageing level, presenting today the highest percentage of people aged 65+ in Europe (21.7 percent in 2015, 21.4 in 2014) (http://ec.europa.eu/eurostat/data/database). By 2030 is expected a steady reduction of the already very low potential dependency ratio: the number of working adult individuals aged 18–64 compared to that of older individuals is expected to fall from the approx. current 4.4 people to 2.1 by 2030 (ISTAT 2011).

Older Italians show a growing tendency to suffer from social isolation and loneliness, possibly reflecting a perception of worsening social integration and lower intergenerational solidarity (Dykstra 2009). This is also confirmed by national data showing a decrease over time in the number of Italian households with older people receiving unpaid help, while households with children keep on benefiting from external support almost like in the past (Sabbadini 2010).

Table 1 Changes in the Age Composition of Italian Population (1982–2030) Source WHO (2011)

Year	Italian population (thousands)	Population aged 65 + (thousands)	Percent
2000	57,116	10,528	18.4
2020	60,408	13,878	23
2030	59,549	15,932	26.8
2050	57,066	18,977	33.3

Linked with the ageing of the population is the increase of people in need of care. Functional and activity limitations are far from uncommon in the Italian older population. 12.8% of the 65+ population reports limitation in the Activities of Daily Living, 10.2% limitations in the ability to move freely, 9.2 is confined at home while 5.2 has sensory limitations (hearing, sight, or speech). Overall, 19.8% of the older Italian population reports one form of autonomy limitation[135].

In the near future, ageing will also affect the availability of care workforce, as also the formal sector today is affected by a chronic shortage of nursing staff (WHO 2006). The composition of LTC staff is already problematic since a high proportion of these are approaching retirement age.

People with dementia

According to the Italian Ministry of Health, the number of people suffering from dementia in the Country is higher than 1 million (of which about 600,000 have Alzheimer) and the number of caregiver directly and indirectly involved in providing support to these people is roughly 3 millions[136].

Current Status of Care provision to older people in Italy

The Italian welfare system has traditionally relied on a family-based approach to older people care. Here, the level of formal care provision has always been marginal when compared to other Western welfare systems, such as the those of the UK, Germany and the Scandinavian Countries. The following tables by Campbell and colleagues shows these clear differences[137].

Table 2 Community-based services, Cash allowances, and residential care to people 65+ in selected Countries (year 2012)

	England		Germany		Italy		Japan		Sweden	
	$/65+	%	$/65+	%	$/65+	%	$/65+	%	$/65+	%
Community services	291		320		249		962	10.3	2598	
Home Help	242	4.4	243	3.1	169	5.7	242	4.7		9.1
Day Care	50	0.8	18	0.2	81		517	6.7		
Respite			27	0.1			159	1.4		0.0
Unallocated			31				44			
Cash allowances	1294	23.5	379	6.4	1070	12.3				
Institutional	508	2.8	944	4.0	386	2.1	1587	4.8	3801	4.7
Social	362	1.9								0.6
Nursing	146	0.9	944	4.0	386	2.1	1039	3.8		2.7
Nursing +							428	1.0		1.5
Unallocated							120			
Administration	163		73		35		204			
TOT	2280		1744	12.3	1849		2832	15.0	6399	

The Institutional care setting is not much developed, with the exception of the Northern regions (e.g. Lombardy and Veneto), and this can be seen using the available comparable date. The Coverage of Institutions is rather low (2.1% of people 65+), as well as the costs for resident, this resulting often in unsatisfactory levels of quality of care.

Table 3 Publicly Supported Institutional Care, 2012[1]

	Australia	England	Germany	Italy	Japan	Sweden	US
Coverage, all institutions	5.0	2.8	4.0	2.1	4.8	4.7	2.5
Coverage, nursing homes	4.0	0.9	4.0	2.1	3.8	2.7	2.5
Monthly public spending, nursing homes per resident	$3,156	$1,351	$1,985	$1,522	$2,276	$5,520	$3,544
Annual public spending for all institutions/65+ population	$1,895	$508	$944	$386	$1,587	$3,801	$1,081

The main support for older people facing the consequences of dependency is that of the care allowances from the National Institute of Pensions. In this respect, the coverage of the measure and its intensity (expressed in monetary amount) is comparable and even higher than that observed in other industrialized countries.

The most important Italian cash allowance is offered by the state and is called the '"Indennità di Accompagnamento'" (IA). It is provided to 12.3% of the older population. The IA is a universal care allowance offered after a needs assessment to all fully dependent people, i.e. those who cannot walk without a helper and/or need continuous supervision and support for ADLs and IADLs. All users benefiting from the IA receive around 500 Euros per month, which is not means-tested and can be spent without any constraint.

Table 4 Cash Allowances in selected Countries (year 2012)[2]

	Australia		England		Germany		Italy
	Carer Payment	Carer Allowance	Attendance	Disability Living	Cash Only	Also Gets Services	IA
Coverage /65+	2.4	7.4	15.2	8.2	5.1	1.3	12.3
Monthly spending /recipient	$856	$158	$426	$522	$466	$362	$539
Annual spending other cash/65+			$151				$12
Annual spending all cash/65+	$391		$1,294		$379		$1,070

Due to the overlapping of an increased female employment, such generous cash-for-care schemes (which can be used without any restriction) and a still "familistic" approach to elder care, in the last

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[1] Note coverage is percent of the 65+ population, Sweden is for all institutions, and the US coverage and monthly spending per nursing home resident is Medicaid only. US coverage is for 2011.The last row is the same as Table 1. The second and third rows pertain only to residents who receive at least some public support.

[2] Note: "Cash only" payments for Germany include social security benefits and respite care for people who remain home. Spending for cash allowances not included in the first rowis shown in the third row (as $PPP/65+). The English figure is for five other cash allowances, and the Italian for "Assegni di cura" and vouchers. The final row shows the same data as in Table 1.

decade an increasing number of Italian families have indeed opted to privately employ a migrant care worker, often on a live-in basis, in order to provide support to their frail older members.

Figure 1 Trends in the employment of private home care workers formally hired by Italian families according to nationality (years 2005-2014) Source: Italian National Institute of Pensions
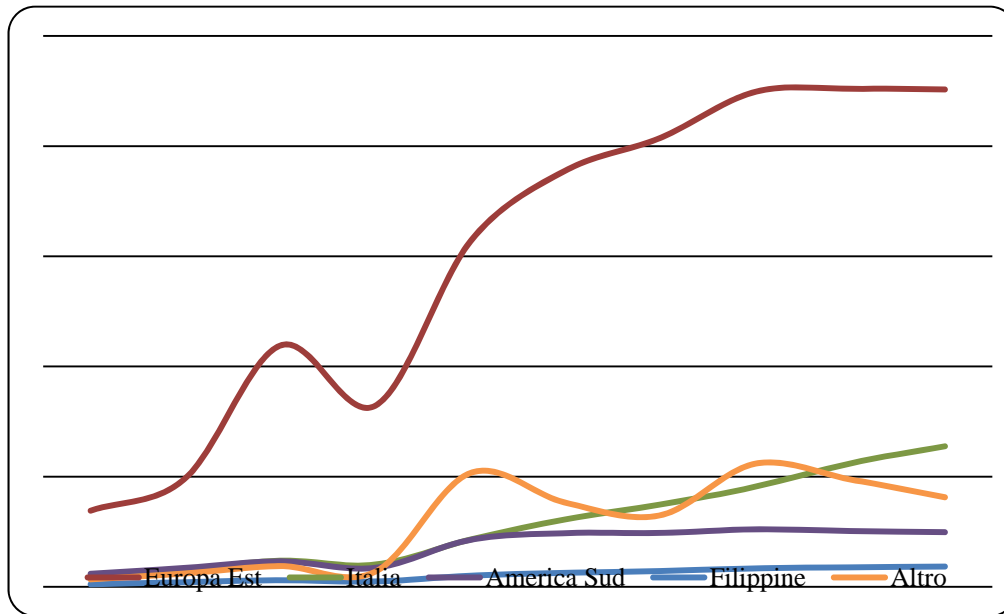
Care services for people with dementia[3]

In Italy policy responsibilities are split among different administrative levels, therefore strategies addressing dementia differ according to regional-level factors and are tailored to the specific characteristics of local contexts. Italy's first national dementia strategy was developed by the Ministry of Health in close cooperation with the regions and the national patient and carer associations, and was approved in October 2014. It will be implemented at the regional level and monitored at the national level. Many regions, responding to their specific needs, have therefore developed regional plans for the implementation of the national strategy. For instance, the dementia plan of the Marche region focuses on the most relevant local issues such as reducing fragmentation of care, developing integrated care pathways and increasing community care services.

The availability of specific services for dementia are thus very much depending on the context of living of the person. No official data can be found regarding the prevalence of service use among people with dementia. This is no surprise considering that even the number of people with dementia needs to be estimated using local surveys. A recent study suggests, however, that the use of services is very low among dementia patients, especially among those with mild to moderate dementia (see figure below).

Figure 2 Frequency of support services and medications use (n=438) Source: Chiatti et al (2015)
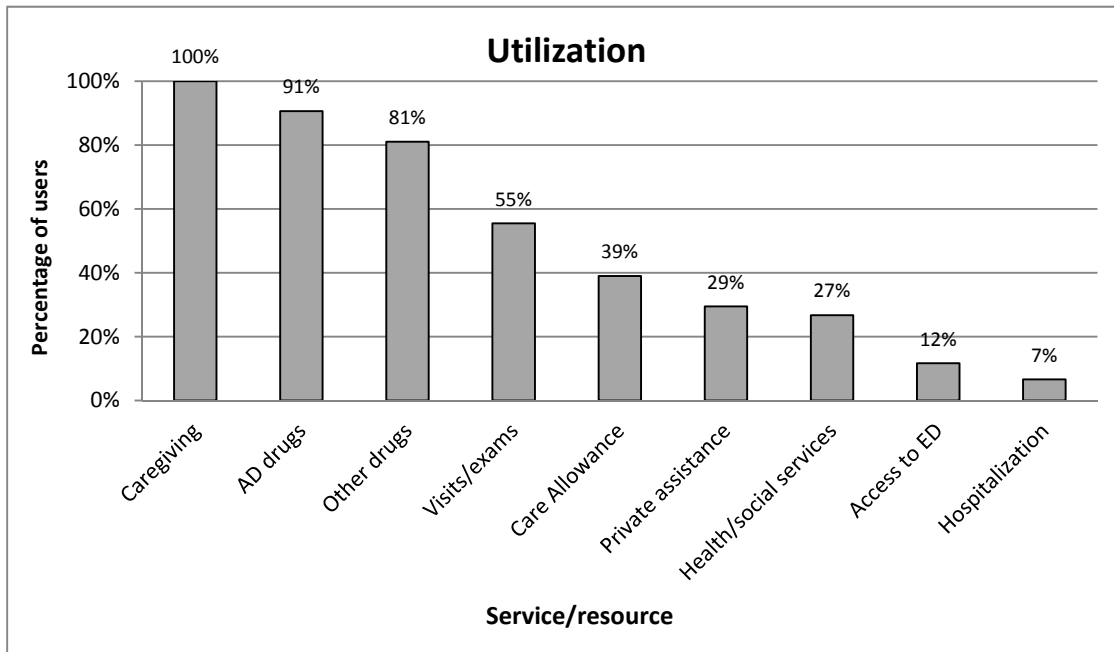
3.1.2   Economic Driver

Current Status of Long-term Care Expenditure

The recent trend of public expenditure for elderly care in Italy suggest a substantial stability of the resources invested in this sector. The main cost component is that related to the Care Allowance, which are granted to the family.

Table 5 Trends in public expenditure in support measures for dependent people 65+ (% of GDP and nominal value in millions of €) (years 2005-2014) Source: Barbabella et al, 2015

		2005	2008	2011	2014	Δ 2005 – 2014	Δ 2011 – 2014
Health Care	% GDP	0,46%	0,49%	0,51%	0,44%		
	mil. euro	6.600	7.700	8.100	7.100	+500	-1.000
Care Allowance	% GDP	0,49%	0,56%	0,61%	0,64%		
	mil. euro	7.000	8.800	9.600	10.300	+3.300	+700
Municipalities expenditures	% GDP	0,11%	0,13%	0,17%	0,19%		
	mil. euro	1.600	2.100	2.700	3.100	+1.500	+400
D) Totale	**% GDP**	**1,07%**	**1,18%**	**1,28%**	**1,27%**		
	mil. euro	**15,400**	**18,600**	**20,200**	**20,500**	**+5,100**	**+300**

Care expenditure for people with dementia

To accurately estimate the societal impact of AD, one needs to consider that patients' families are also affected, as since the burden of care in many countries, including Italy, mainly falls on them. AD is called known as a '"family illness'", because family caregivers of AD patients often represent hidden secondary patients. They frequently experience high levels of stress, that are associated with a higher risk of developing mood disorders, depression, insomnia and a generally lower quality of life. Anxiety and stress also increase their likelihood of developing physical problems, such as headache, back pain and, excess weight, and exposes them to a higher rate of mortality compared to their non-caregiver counterparts.

The patterns of care provision to older people with dementia clearly reflect the structure of the overall Italian elderly care system, which traditionally falls outside of the formal sector (e.g. NHS and Municipality). A study by Chiatti and colleagues[138], carried out in the Marche Region in a sample of 438 patients with early stage and moderate Alzheimer's Disease revealed that the number of hours of informal care provided by the primary caregiver (time spent in supervision and/or direct care) reaches up to 50.2 hrs/wk, to which must be added an extra 20 hrs/wk from other informal caregivers. This analysis showed also that whereas the estimated societal burden of patients with early to moderate Alzheimer is about €20,000/year (Table 3). the cost borne by the public sector is only €4,534/year.

3.1.3 Technological Driver

The last National health care plan together with the Dementia Care plan, identify that of technological innovation as one of the main measures to increase the efficiency of the existing services.

In addition, that of AAL has been identified as a strategic area by the Italian Ministry of research (MIUR). In order to increase the competitiveness of the Italian companies in the global market, a so-called National "Smart living" Cluster has been established. The cluster work to involve public and private subjects in different area promoted by MIUR. It aggregates enterprises, universities, research institutions and financial stakeholders under a unique association and they discuss with local, regional and national administrations. It represents a permanent structure to elaborate and supply new ideas, to support industrial research politics and to integrate different financial national strategies.

According to MIUR, the Cluster represents an inclusive and open networking to optimize resources' use and to obtain results that contribute to the economic growth and to wellbeing of people. If the network system reduces fragmentations and deletes duplications, it will be possible to achieve benefits. This is an integrated and coordinated system. It focuses on social and competitive challenges and it would rise the competitiveness of industrial enterprises[3].

3.2 Norway

3.2.1 Demographic and Sociological Drivers

Ageing Population

The total population of Norway was 5 165 802 on 1 January 2015[139].

Population by age:

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[3] More information can be found (in Italian only) on the website http://www.smartlivingtech.it/it/content/homepage

- Number of people aged 20-66:   3,184,162   (61.6 %)
- Number of people aged 67-79:   502,304   (9.7 %)
- Number of people aged 80 or over: 220,437   (4.3 %)

Ageing trend

Today, just over one in ten people in Norway are aged 70 years or over. This percentage is set to increase. In the medium alternative, roughly every fifth person in Norway will be aged 70 or over by 2060. The share of elderly will see a particular increase when the post-war baby boomers are elderly. Although Norway is aging, the aging population in Norway will be far smaller than in many other countries. This is because Norway has had a less negative fertility development and relatively high immigration compared with other countries in Europe and the west in general[140].

People with dementia

Vossius, C. et.al (2015)[141] have conducted a project on behalf of the Norwegian Directorate of Health, as a part of the dementia plan for 2015. The purpose was to survey the use of municipal healthcare services, specialized healthcare services, and the scope of help from informal carers to people with dementia. Based on this research, they have made an estimate for costs related to people with dementia. The research includes data from 5,630 people, whereas 2,771 of the people had dementia.

Estimations from Alzheimer Europe indicate that the number of people with dementia in Norway is 78 000. This number will, according to Statistics Norway, increase to around 112,000 in 2030 (2 % of the population), and to 200,000 in 2060 (3 % of the population).

Current Status of Home Care Assistance

The table `Nursing and care services – key figures`[142] shows that in 2014:

- **The total amount of users of care services was 271,743.**
- The amount of residents living in institutions, short-term stay, was 9,230.
- The amount of residents living in institutions, long-term stay, was 33,843.
- The total amount of users of home-based services was 228,670:
    - Users of home help only: 39,078
    - Users of home nursing only: 77,864
    - Users of both home help and home nursing: 63,085
    - Users of other home-based services: 48,643

Home-based care services include nursing services in the home, home help, rehabilitation and other services for users living at home, independent of age and diagnosis.

Trend in Home Care Assistance

A publication from Statistics Norway in 2013[143] **shows that** (direct quotation):

During the 1960s there was a strong growth in the public supply of long-term care services. Over the last 30 years the percentage of elderly living in long-term care institutions have been reduced, and those who do live in institutions are more in need of care than used to be the case. **In 1991 half of the elderly above 90 years were living in institutions. In 2011 this figure had been reduced to less than one third. Today four out of five elderly live in their own homes without any assistance from**

municipal services, while one out of five live at home with services or in some form of assisted housing. The number of elderly receiving municipal services is the same today as in 2008.

Private unpaid care plays an important role in the care for the elderly. Even if the municipal services now performs the greatest share of the total care work, that does not mean that informal care givers are totally out of the picture. Many elderly who are in need of care get care from family, neighbours or friends in addition to the municipal services they receive.

Statistics from 2015[144] shows that (direct quotation)**:**

The total number of users of home-based services has remained almost unchanged at 190,000 users. The number of older users (67 years and over) has decreased by 1,000 to a total of 107,500, and the number of young users has increased by the same number, to a total of 84,500 users. There has been a marked decrease in the number of users of home-based services for people 80 years and over.

The share of users with extensive need for assistance has increased in all age groups.

The growing need for resources due to more users with an extensive need for assistance is met by an increase in the number of man-years per user from 0.45 man/years in 2009 to 0.49 man<7years in 2014. There are now 134 000 man-years in the care services in Norway. This includes 10,000 man-years from private enterprises, operating on behalf of the public services. For the first time, commercially based enterprises offer more beds than non-profit organisations.

Healthcare services for people with dementia[3]

Half of the people with dementia receive home nursing, 30 % live in sheltered homes, 5 % live in houses of multiple occupancy and 20 % use day activity centres.

People with dementia constitute over 80 % of nursing home residents in Norway. Within three years after the dementia diagnosis is set, half of the people has moved to a nursing home. In average, patients at nursing homes die within 2.1 years, and the highest death rate is during the first year.

Informal help for people with dementia[3]

90 % of the people with dementia receive help from their relatives/informal carers (Vossius, C. et.al 2015)[3]. In the early phase of the disease – when the dementia diagnosis is set – PWD receive in average 60-85 hours of help per month, including mostly help with IADL (instrumental activities in daily life). In the later phase of the disease – right before PWD move to a nursing home – the scope of help increases to around 160 hours per month, and includes mostly help with PADL (personal activities in daily life).

About half of the selection of relatives/informal carers is gainfully employed, and among them between 20 and 50 % state that they loose work hours because of care and supervision of the patient. However, less than 1 % quit their job in order to take care of the patient.

3.2.2   Economic Driver

Current Status of Healthcare Expenditure

In 2014, the expenditure in municipal care services was 100,917,838 NOK (10,987,244 EUR).

Gross expenditure in municipal health and care services in 2014 – NOK 1000[145]**:**

- Total: 121,703,543 NOK   (13,250,250 EUR)
- Nursing and care services in institutions: 41,485,362 NOK   (4,516,643 EUR)

- Nursing and care services, home-based: 49,683,784 NOK   (5 409 231 EUR)

According to statistics from OECD for 2013, the public sector covers 85 % of the total healthcare costs, and the remaining 15 % is user fee[146].

Healthcare expenditure for people with dementia[3]

The annual cost to health and care services for patients with dementia, is 358,000 NOK per person. The total cost is 28 billion NOK per year. The total cost throughout the course of the disease (in average 8.1 years) is 2.9 million NOK per patient. Stays in hospitals constitute 11 % of the total cost, home nursing 20 %, stays in nursing homes 60 %, and other expenses 9 %. Hence, the cost increases dramatically when the patient moves to a nursing home. The municipalities finance 76 % of the total cost, the government finance 12 % and the patients themselves finance the remaining 12 %.

Half of the people with dementia receive home nursing, but the amount of assigned hours per month varies according to the stage of the disease. The last month before inpatient on nursing home, the patient receives 4 hours home nursing per week. In the period from symptom start to the set of diagnosis, the monthly cost is in average 6,400 NOK, while in the period between the set of diagnosis and inpatient on nursing home the monthly cost is 10,800 NOK.

People with dementia constitute over 80 % of nursing home residents in Norway. Hence, most of the cost for municipal services is related to dementia. The annual cost for one nursing home resident is 814 166 NOK, and the resident pays about 17 % of the cost.

Trend in Healthcare Expenditure

In 2014, expenses related to care services in Norway exceeded NOK 100 billion. The share of home-based care services increased to an all-time high, making up almost half of the total expenses, while the share of expenses related to institutions decreased to 45 per cent. Five per cent of the total expenses covered social activity and additional services. This has remained virtually unchanged for several years.

The use of healthcare resources in the future is uncertain because the need for care and organizing may change considerably. Given that the indication for inpatient at nursing homes does not change, there will be a need for 40,000 nursing home beds in 2030, and 70000 beds in 2060, compared to 28,000 per today.

3.2.3   Technological Driver (Telemedicine, Telecare & e-Health in Norway)

National initiatives

`National action plan for e-health 2014-2016 [147] contains an overall presentation of ongoing and planned e-health initiatives of national importance for the period 2014-2016. The three main goals for the ICT development in the healthcare sector in Norway are:

- Health professionals should have easy and secure access to patient and user information
- Residents will have access to simple and secure digital services
- Data should be available for quality improvement, health monitoring, management and research

In order to reach these goals, the Government will, among other things, aim for new digital services for patients and users, such as the web-based `My health´ service, and stronger national control and coordination of ICT development in the healthcare sector.

The Ministry of Health and Care has decided to create a new agency named `The directorate for e-health´, with effect from 1th of January 2016[148].

According to one of the parliamentary reports[149], the use of new technology, such as telemedicine consultations, can help move the specialized services closer to where patients live and to strengthen the competence in GP practices and in primary healthcare.

Moreover, it is required that all nursing homes and care residents that are funded by `Husbanken` (The Norwegian State Housing Bank) must be adapted for connection of welfare technology.

EPR, e-prescription and `My health´

During the year 2000 **Electronic Patient Records** (EPR) were introduced in hospitals, general practitioner's (GP) offices and municipal institutions in Norway. The municipal healthcare services outside of GP practices have had slower development, but have increased investments and made good progress in the recent years. This places Norway among the countries in the world with the greatest degree of introduction of EPR in healthcare services[150].

DIPS EPR system is used in 73 % of Norwegian hospitals. Five of the seven university hospitals in Norway use DIPS EPR, providing vital functionality to 57,000 professional users.

In 2013 **E-prescription** (electronic prescription) was introduced in Norway. It is a prescription that is not printed on paper, but that your doctor sends electronically to a central prescription database. Patients can find information about their e-prescriptions by logging in to `My health` at www.helsenorge.no.

At `**My health´** users can also get information about deductibles, change their regular GP, book European health insurance card, report side effects, see their core record, and watch their appointments at hospitals in the Western Region of Norway. Some of the services are still under development and trial.

Electronic exchange of health information

FUNNKe[151] (2011-2014) was a regional program for implementation of electronic messaging. The project was completed in 2014. The program reached its goal. Nursing and care services in 85 of 87 municipalities in the north region in Norway communicate with hospitals and GP´s.

Telecare for elderly and people with dementia

Norsk Telemedisin AS (Norwegian Telemedicine) is a supplier of tele medicine and video communication. They offer a camera supervision system called ´Nattfred´[152] (`Peace at night´) for users who need nightly supervision or extra care and safety in their homes. Nattfred works in total darkness, and can capture movements, which gives an alarm/message to caregivers. Families or care personnel performs camera supervision through a computer program (Windows). `Nattfred´ is developed by the Swedish company JoiceCare [153].

Reports by IRIS [154] and Västerås Stad [155] (in Sweden), indicate that the camera supervision system can reduce transportation costs and costs related to time of effort, in home care services.

Norsk Telemedisin also offer **Nära** (Swedish word for ´close´), which is a video communication system that allows the user to watch and talk with others by using their TV. The system consists of a videophone that connects to a standard TV. The carer/friend/relative on the other end may use a PC, tablet or smartphone with webcam and headset. The elderly uses a remote control to call and receive

phone calls. If the person is not available for a JoiceCare call, the call is diverted to a predefined phone. Nära is also developed by JoiceCare.

A study assigned by TA-SWISS [156] shows the current state and future developments within telecare in soe European countires, including Norway (however, the year of publication is not available). The study shows that **alarm systems**, belonging to the first generation of telecare devices, currently make up a major part of telecare applications across Europe. The application of some form of alarm system was mentioned by at least one expert of every country included in the study. In Belgium as well as in Norway, various telecare technologies are already in use, including **communication technologies, surveillance and security systems, sensors and tracking devices**. In Norway, "the pendent alarm" is already installed by 77,000 users.

In the project "Safety package", supported by the Regional Research Fund, Bærum municipality has tested 10 **medicine dispensers** of the type `Pilly´[157] in close cooperation with the supplier Dignio AS and SINTEF[158]. In all, 16 different users tested out Pilly during the pilot period. The pilot has established an understanding in the municipality that Pilly has a great potential to give more correct medication because it "forces" appropriate time for medication.

In addition, some of the users experienced increased independency, mastery/coping and freedom because they can handle the medication their self and no longer need home visits from the home services. Users with physical function challenges and limited cognitive functions experienced the most benefit of Pilly.

3.3 Sweden

3.3.1 Demographic trends and challenges

The administrative agency Statistics Sweden (Statistiska Centralbyrån) provides following information:

Sweden has approx. 10 million inhabitants; in 2014 20% of them were above 65 years. This segment of the population is growing and in 2060 it is estimated that 25% of the population is above 65 years. During the same time period, the part of the population in working age, 20-65 years, is estimated to decrease from 58% to 52%.

An increasing number of the population is migrants, currently coming from the Middle East and Northern Africa, the majority of them are men in working age coming without families, but also children coming alone seek asylum. There is also an increasing proportion of the population above 65 years that are born outside Sweden. To a large extent they came to Sweden 20-30 years ago, however, in particular the women don't know the Swedish language. In 2060, it is estimated that 11% of the population above 80 years will be migrants.

A current demographic trend is the growing of the urban areas, with more people, in particularly younger are moving in. Sweden has large areas, in particular in the north, that are very sparsely populated and where the majority of people are older. They are facing declining availability to services (grocery stores, postal services, transportation etc) and increasing isolation while at the same time their health declines and their needs of health care and social services increase.

Sweden is traditionally a fairly equal country, compared to most others, mainly due to the tax funded health care and social services systems. There is however a trend with increasing inequality in terms of differences in life conditions and possibilities. Those that have higher income, are born and raised in

Sweden, and don't have any disability are better off that the less wealthy, the migrants and those living with a disability.

Dementia

Health and Medical Services Act (SFS 1982:763) states that every county council must provide residents with good-quality health and medical care, and work to promote good health for the entire population. That is, the county councils and to some extent the municipalities are responsible for providing the health care (https://sweden.se/society/health-care-in-sweden/)

In Sweden, there are around 160,000 persons that are diagnosed with a dementia disease. During the last 15 years, the actual number of PwD has increased.

In 2010, National Guidelines for Care in Dementia Diseases were launched in Sweden. According to the Guidelines a person-centred approach should be applied in all care interventions. Multiprofessional teamwork, education, diagnostics, pharmacological treatment, care, daily activities, housing and support to informal carers are important dimensions that should be directed. A thorough assessment including physical and cognitive tests, laboratory testing and interviews are essential for diagnosing a person with a dementia disease. Pharmacological treatment is available, however, approx. 50% of PwD do not get access to the right medication (The National Board of Health and Welfare (Socialstyrelsen), 2012 Demenssjukdomarnas Samhällskostnader i Sverige 2012). Access to daily activities is recommended, as is access to sheltered housing when needed. All staff should have adequate, continuous training in meeting and caring for people with dementia.

Housing and home help services

Sweden applies an "ageing-in-place-policy", aiming at enhancing for all people to live in their own home as long as possible. Social services for help with daily activities as well as health care for people over 65 years are provided by the municipality, and advanced health care in the home is provided by the county council. This means that the vast majority of people diagnosed with dementia are living in their own homes, alone or with a spouse. Most often, nurses that are specialized in dementia care coordinate the interventions around community-living PwD and their relatives. Caring for people with dementia is demanding and the situation for informal caregivers, often an older spouse, requires attention. In particular, caregiver burden needs to reduced.

Sheltered housing

Approx 87 000 people above 65 years are currently living in sheltered housing, equivalent to approx. 5% of the population in this age group. 69% are women. People diagnosed with dementia are often living housing with staff especially trained in dementia care.

3.3.2   Economic drivers

The total societal costs have declined mainly due to the fact that more PwD remain living in their own homes and less live in sheltered housing/nursing homes. However, the costs for the municipalities for home care services, informal care, housing adaptations and technical devices have increased. The costs for the municipalities for home care services, informal care, housing adaptations and technical devices has increased and all in all, the annual costs for a person with a dementia disease is about 400.000 Swedish Kronor (approx..42.00 Euros) that is, in total 6.5 billion Euros. Out of this, the annual costs for informal care are approx. 1.3 billion Euro (20%). (The National Board of Health and Welfare (Socialstyrelsen), 2012 Demenssjukdomarnas Samhällskostnader i Sverige 2012)

The estimated reduction of the labor force together with an increase number of older people, in the group above 80 years, challenges the society. The number of tax-payers will reduce and accordingly, novel, cost-effective solutions that can improve the life situation for people with dementia as well as formal and informal caregivers is crucial.

3.3.3 Technical drivers, e-health

Challenges - The home will continuously be the context for health care and services

An aging population is one of the major challenges in Sweden and throughout the developed world. Several trends indicate that we move from institutional care towards a greater focus on the individual in the home. We take more responsibility for our own health because we want to keep ourselves healthy longer and to delay the need for care and attention. When the disease eventually comes anyway, we want to manage ourselves and live a life at home with good quality.

The international community has been very clearly identified demographic change, with an increasingly aging population, as one of the major societal challenges. We adopted a increased age to a greater extent developing chronic diseases and for a longer period to be in need of care and attention. The predictable the effect of this is increased costs in health care and even greater extent increased costs of care. According to the Agency for Care Analysis report VIP in health care? the chronic diseases already stands for 80-85 percent of total healthcare costs. eHealth and the use of ICT solutions will be strategically to during the life cycle postpone the need for care and attention by health promotion measures supported before the need arises.

Once it arises, solutions in e Health bring effective support for individuals, with both a positive quality of life and good cost control. EU and The European Commission faces challenges in this field among another by, in the large research and innovation program Horizon 2014-2020, to devote considerable resources to the development and introduction of new solutions. Health is the largest monetary area and about 15 percent of the total budget of the corresponding 80 billion allocated here.

Trend in e-health

- A growing focus on the health of individuals and populations. Individuals to take greater responsibility for their own health and assumes
- active cooperation with professionals and actors in health care and care.
- ICT is introduced in the health and social care which enables the operation can be conducted more efficiently.
- More and more people involved in the network around the individual, eg, families and health care providers. ICT enables a functioning information flow in the network.
- The next generation of older people is accustomed to manage their contacts digitally. This is supported by improved Internet access, mobile technology, tablet, new information systems and big data analysis as decision support, as well as through social networks.

Together these factors offer a future in which it is possible to provide personal health care of high quality, without always having to go through a physically present person.
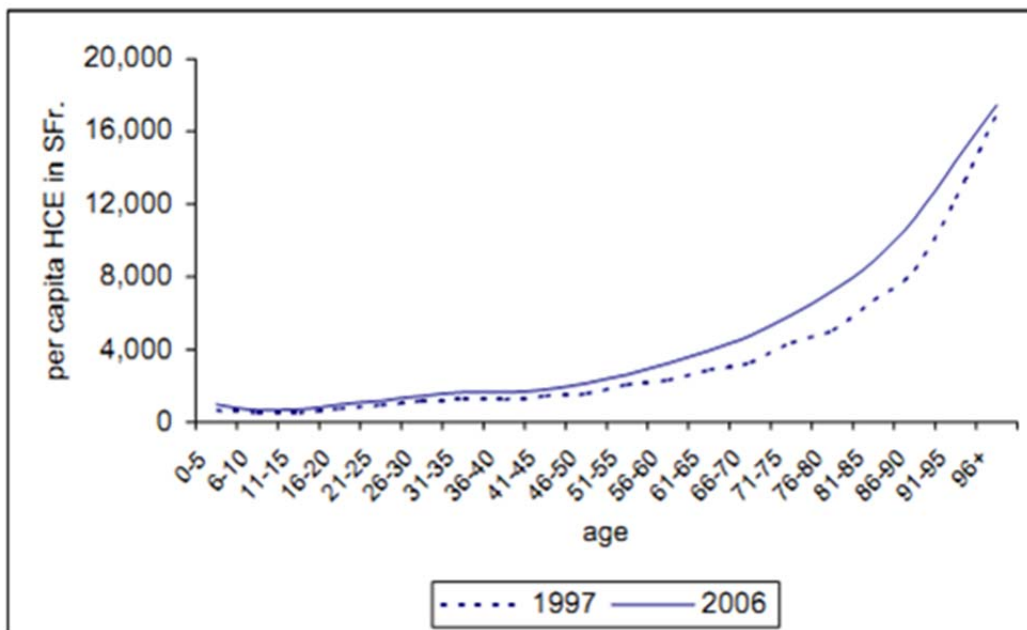
3.4   Switzerland

3.4.1   Economic Driver

According to statistics from 2010, the percentage share of health care expenditure (HCE) of the Swiss GDP was 11.4%. Furthermore, Swiss inhabitants spent on average CHF 7,876 on health care annually with an increase of 2.5% compared to the previous year (Federal Office of Public Health, 2011).

As shown in the graph below, the older the person, the more they spend on health care. From age 65 and over, health care expenditure per capita increased exponentially and reached CHF 18,000 per year (see Figure 1). On the other hand, healthcare expenditure of people younger than 65 remained quite stable in the past 10 years. As a result, "per capita spending in 2006 for aged 66 and over was four times higher than for aged 0-65. In 1997, this ratio equalled to 3.85, which is 3.93% lower than in 2006". This showed that there is a trend that elderly people who are older than 65 are willing to spend more in health care services and products than 10 years ago (Felder & Werblow, 2008).

Statistics in 2007 showed that the canton with the highest health care expenditure per capita was Geneva, followed by Basel-Stadt, Ticino and Vaud (Reich, Weins, Schusterschitz, & Thoni, 2011).

Figure 3 **Change in Age Profile of per capita HCE in Switzerland, 1997-2006 (Felder & Werblow, 2008)**

3.4.2   Demographic Driver

According to the Federal Statistic Office of Switzerland, the percentage of the entire population aged 65 and over was 16.9% in 2010 and it is forecasted to increase to 20.1% in 2020. This percentage will keep growing in the next 50 years and it is expected to reach 28.3% in 2060. In terms of the absolute number, from 2010 to 2060, the population aged 65 and over will increase from 1.7 million to 2.5 million. At the same time, the percentage of the elderly over 79 is also growing, from 28% in 2010 to 32.4% in 2030 and 42% in 2060, which indicates that the Swiss population is ageing over period of time.

The five cantons with the highest share of the population aged 65 and over in 2010 were Basel-Stadt (20.8%), Ticino (20.4%), Basel-Landschaft (19.5%), Schaffhausen (19.4%) and Bern (18.8%), which are

all within the Swiss-German and Swiss-Italian part. In terms of absolute numbers, the top five cantons were Zurich (220,466), Bern (182,833), Vaud (109,995), Aargau (93,163) and St. Gallen (76,373) (Swiss Federal Statistical Office, 2010).

3.4.3 Sociological Driver

According to HAPPI (Housing our Ageing Population Panel for Innovation) report, the social and cultural changes have made it less certain that successive generations will be able and willing to take on the responsibility of looking after others. Some elderly people want to avoid becoming a burden for their families. As a result, there is an increase in the number of elderly people that have to take care of themselves (CLG, DH and HCA, 2010).

A sociological study by North Umbria University shows the following trend in the society: "elderly people want to age in place, continue with their daily routines and maintain their independence and lifestyles in a safe and effective manner in a way that contributes to their well-being and quality of life" (Cook, 2010). Interviews carried out by CNN in US also demonstrate that aging in place with sensors has become more acceptable and desirable, because it is less expensive than a nursing house, ensures the security and brings peace of mind (Townsend, Knoefel, & Goubran, 2011).

Furthermore, "Privacy Versus Autonomy" has been studied by the Institute of Electrical and Electronics Engineers (IEEE) and gives a result of positive view towards home monitoring sensors. By accepting this monitoring technology, older adults are now more willing to trade their privacy with autonomy. At the same time, the loss of autonomy associated with placement in a nursing home was less accepted than the loss of privacy associated with the monitoring sensors (Townsend, Knoefel, & Goubran, 2011). Elderly's Rejection to External Help

While there are increasing organizations in the society aiming to offer care and help to the elderly, the seniors react in different ways. When it comes to receiving assistance from externals, some elderly feel comfortable while others reject the aid. A study shows that for the elderly who used to have great pleasure helping people during their life, are feeling uncomfortable to accept care themselves. This becomes the biggest obstacle for them to receive the external help. The elderly prefer to manage everything by themselves whenever possible. As a result, they also tend to refuse the telealarm watch or other health care solutions to show their independence (NewYork-Presbyterian Hospital , 2006).

3.4.4 Technological Driver

Advancement in technology has improved the life quality of elderly people and stimulated the invention of new systems such as Telehealth and Telecare that allow them to live longer at home (medetel, 2004). The development and the increasing usage of health care technology will also contribute to make elderly people more independent (Craig, Nugent, & Mulvenna, 2008). The cantonal and federal governments of Switzerland are also working on new strategies for the care. By the end of 2015, they are aiming to make a standardize patients' summary and health record. At the same time, they would like to introduce the E-Prescription, a process that electronically transfers the patient's prescription to a pharmacy and allows the patient to retrieve his/her drugs. It is statistically proved that this system, if successfully applied, can save up to 144 million Swiss Francs of the medical expenditures.

Another E-health care strategy they would like to implement is called Telemedicine, which is the delivery of health care services to a patient that is not physically present in the same place. Telemedicine is a broad concept, which includes Tele-consultations between doctors and patients and the presence of call centres, which guarantee information and care for the patient, wherever they are, those services are covered by the health insurance companies.

E-card, a national Health Insurance created for administrative data, was introduced in 2010. Its main purpose is to be used as a health care ID. Every citizen will receive the new insurance E-card where a microchip is incorporated. On the chip, the patient's administrative and medical data (emergency data) are saved. The new E-card is important because of its function as an authentication instrument for patients

4. Competition Analysis

4.1 Italy

4.1.1 Telesalvalavita

Supplier: Beghelli

URL: http://www.beghelli.it/it/ita/indice-prodotti.asp?idCat=57

Country: Italy

Price: Around 200€ for the home device

Distribution Channel: Can be purchased individually by users in stores

Packages and Description:

Beghelli provides different type of devices for telecare and home security. They are divided into three categories:

- Remote assistance & burglar alarm system;
- Emergency alarm;
- Security & Gas.

Beghelli also provides the listening service SOS Beghelli, operating throughout the country 24 hours a 24, which, in case of alarm, activates the procedures agreed in advance with the customer.

Remote assistance & burglar alarm system:

TelesalvaLaVita System - Integrated remote assistance and burglar alarm system with speech messages and speaker with remote control. It allows the user to call for help by pressing the red button on the remote control or on the device. Expandable with other sensors: it can send intrusion, flood, smoke, and gas alarms. It works even without electricity.

Emergency alarm

TeleSalvalavita + Service Beghelli - Remote assistance device linked to the SOS Beghelli Centre. It allows the user to call the SOS Centre for help. It works even without electricity.

Telesalvalavita Family - Safety system for health emergencies, methane gas leak, presence of carbon monoxide, flooding.

Security & gas

Sentigas Duo Beghelli - Electronic methane gas and carbon monoxide detector with a loud audible alarm.

Rivelogas Beghelli - Electronic methane gas detector with a loud audible alarm.

4.1.2 Unirete Telecomunicazioni

Supplier: Unirete Telecomunicazioni

URL: http://www.uniretetelecomunicazioni.it

Country: Italy

Price: Depends on the system

Distribution Channel: System for private users and/or for hospitals and nursing homes

Packages and Description:

Unirete Telecomunicazioni provides systems for home safety, telecare, localization and assistance for elderly. Moreover, it offers specific solutions for Alzheimer patients (localization, door opening monitoring).

Home solution:

The products of interest for home solutions comprise:

- environmental sensors, such as smoke, gas, flooding, contact and presence sensors;
- wearable devices for the emergency call, some of which equipped with GPS;
- wireless alarmed mats for fall detection and escape prevention;
- wireless alarm devices for handles for escape prevention.

Hospitals and nursing homes solutions:

The products of interest for hospitals and nursing home solutions comprise:

- wearable nurse call systems;
- environmental sensors, such as contact and fire sensors and motion sensors for openings (doors and windows);
- photographic sensors to monitor the patient in bed;
- wearable tracking systems exploiting GPS;
- wireless alarmed mats for fall detection and escape prevention;
- wireless alarm devices for handles for escape prevention.

The system has been installed and tested in a number of nursing homes and hospitals throughout the Italian territory.

4.1.3 Assist3, Assist4

Supplier: Urmet ate

URL: http://www.urmet-ate.it/?page_id=134

Country: Italy

Price: Around 300€

Distribution Channel: System for private users

Packages and Description:

Urmet ate provides home equipment for telecare, enabling to send help requests to the assistance services. This service is addressed primarily to the elderly, the disabled people, and those living alone or in isolation.

The Assisted 3 and 4 systems are equipped with a teleassistance terminal able to send an alarm or to connect the user with familiars and skilled personnel. They also have a wearable remote control and can operate even in the absence of electricity. Some safety sensors can be connected to the terminal to detect gas leaks, flooding, falls and intrusions.

4.1.4   Tunstall Home

Supplier: Tunstall

URL: http://www.tunstallhome.com/#WhatIsTunstallHome

Country: UK

Price: 99.00 £ for the initial set-up + 12.99 £ per month.

Distribution Channel: System for private users, purchase from distributors or on-line.

Packages and Description:

Tunstall Home offers a support for people who live alone, are older, have a disability or a long-term health condition. It is a home telecare platform: set of sensors placed in the house, reminders setting, possibility to make a help call to a monitoring centre, which is active 24/7. Tunstall Lifeline Vi is the home unit, in charge of connecting to the response centre.

If the user wants to call a friend, a relative or the emergency services, he just has to press a button to connect to the assistance team, who will talk to him before taking the appropriate action. There is also a smoke detector service: when smoke is detected, a call is raised to the emergency response centre.

4.1.5   myCmon

Supplier: Sistema Casa

URL: http://www.sistemacasa.it/novita/73-mycmon.html

Country: Italy

Price: Not indicated – Consists of an initial cost for the set-up and a monthly fee.

Distribution Channel: System for private users, direct purchase from the manufacturer.

Packages and Description:

The system is intended for the elderly and for people with disabilities: it is essentially a domotic system integrated with a cloud system for monitoring both the health and well-being of the user, and the home environment. In fact, in addition to the advantages of the domotic system (for example the control of lights, temperature and home automation), it allows caregivers to have all the information necessary to determine if the monitored person is healthy, or if it has happened something noteworthy, at any time and from any remote terminal in the network, such as smartphones and tablets.

4.1.6   PicNet

Supplier: Sinthesi

URL: http://www.sinthesi.com/it/esempi-applicativi/case-di-riposo/gestione-impianto-di-chiamata/

Country: Italy

Price: not available on website

Distribution Channel: Systems for nursing homes

Packages and Description:

The system is dedicated to nursing homes, and performs the management of calls and alarms received by the patients' rooms and the call forwarding toward the personal devices of nurses and doctors.

All information and anomalies are detected, controlled and visualized from the system, so to simplify the work of the nurses, of the doctors and of technical maintenance staff too.

The system is composed by a main unit located in the nurses room, which is charge to forward the calls to the various devices connected.

4.1.7   Comfort Zone Check-In

Supplier: Alzheimer Association and Omnilink

URL: http://www.comfortzonecheckin.com/default.aspx

Country: USA

Price: start at 9.99$ per month if choose the smart phone service, $14.99 per month if choose the dedicated GPS device.

Distribution Channel: System for private users

Packages and Description:

System for the localization of patients with Alzheimer's.

The caregiver can receive periodically or on-demand the position of the user carrying the GPS device, and visualize it through a dedicated web application.

The family can choose either a dedicated GPS device (actually not available) or any cellular phone running on the Sprint network. The service offers also a web-based application, by which users can completely monitor the device, performing actions like manage devices, see location information, request a device's current location and manage notifications.

4.1.8 Comfort Zone

Supplier: Alzheimer Association and Omnilink

URL: http://www.alz.org/care/alzheimers-dementia-gps-comfortzone.asp#comfortzone

Country: USA

Price: 45.00$ activation fee + 39.99$ per month (optional: 55$ bracelet or pendant with user's personalized info)

Distribution Channel: System for private users

Packages and Description:

Comfort Zone is a comprehensive web-based location management service powered by Omnilink. Families can monitor the person with Alzheimer's from a secured website and receive alerts when the person leaves a preset safety zone. This comprehensive service includes enrollment in MedicAlert®+ Alzheimer's Association Safe Return® and access to a 24/7 monitoring center to help you with location management if you are unable to get on the Internet. In order to use the service it is necessary to have a device compatible with the Comfort Zone Application, to have the service activated with a Comfort Zone Plan and an internet access. An example of a compatible device is a GPS device as shown below

CalAmp LMU2610 Vehicle Tracker
Manufacturer: CalAmp, sold by Omnilink
Type: Car device: Needs professional installation
System: GPS
Network: AT&T via Jasper wireless
See coverage map
Accessories: Car wiring harness
®Comfort Zone Inside

Device: $149
Activation: $45

2 min locate
Monthly: $39.99
BUY   INFO

Return policy

The dedicated tracking device that can be easily carried in a pocket or purse, or a device that installs in a car.

4.2 Norway

Smart house technology

Source: Google. Search words: `Smarthusteknologi` (smart house technology) and `Smarthus leverandører` (smart house suppliers).

4.2.1 Visma

- Supplier of products and services that make organizations more effective
- Delivers welfare technology to public services

Products

Visma Care – a complete solution for welfare technology

Vismas´s Electronic Medical Records are integrated with modern welfare technology so that all necessary information about the user is collected in one place.

URL: www.visma.no/unique/pasientjournal/velferdsteknologi/

YouTube video: https://youtu.be/McHA5oLQbtI

1. **Visma Care Profile** – Electronic Medical Records for the care sector, is a complete solution for nursing, rehabilitation and care services in the municipalities. Functionality covers requirements for documentation and monitoring related to most disciplines, with focus on managers, doctors, nurses, therapists, and more.
2. **Visma Mobile Care** – a portable web application solution for care services in municipalities, containing Electronic Medical Records.
3. **Sensor Solution** – Users have installed a "central unit" on a wall in their own homes. Sensors adapted to each user send information to this panel by using radio signals. The central unit then sends the information on to the nursing and care system in the municipality.

Example of sensors:

- Water sensor – alerts if the water over flows.
- Temperature sensor – alerts if the temperature falls below a defined degree.
- GPS/location alert – carried by a person with reduced orientation abilities.
- Door/motion sensor – detects when the user is going out the door.
- Fall sensor – attached around the wrist like a watch, and alerts fall automatically. It also has an alarm button the user can press.
- Blood pressure monitor – allow users to measure their own blood pressure. Measured values are sent immediately to the home care and are automatically recorded in electronic medical records.

Pricing/Packages

Unknown/not listed.

Market segmentation

B2B – Business to business.

Distribution Channel

Visma delivers the solutions to public services such as municipalities, which offer the solutions to end-users in their area, e.g. nursing homes.

4.2.2 Instell AS

Turnkey supplier of demand control systems and related services and products

- Focuses on energy efficient solutions for private and public housing.
- A supplier of installation material, lighting control, heating control and audio systems.
- Most known for KNX Smart Home solution.

URL: www.instell.no

Products

KNX smart home solution allows the user to control lighting, heating, solar shading and audio from the same `switch` by using panel, PC, smartphone or tablet.

Some of the master features:

- `Away` – One simple click can turn off lighting, and may control the ventilation and heating systems according to predetermined degrees. Also, all sockets for iron, coffee machine, chargers, etc. can be de-energized.
- `At home` – One simple click can turn on lighting, heating/ventilation, etc.

Some of the features:

- Lighting. Climate. Solar shading
- Safety: KNX can supervise all technical installations, and notify the owner of the house or a security company. To avoid water leaks, the system ensures that the main water tap is closed when the house is not in use. The system can notify when windows and doors are unlocked or open. It also includes fire and theft alert, e.g. in case of fire all lighting in all rooms will be turned on.

iKNiX App solution allows you to control the KNX smart home installations by using an app.

Video about JUNG App Smart Remote: https://youtu.be/G0Xy-ywIvVg

Video about JUNG Smart user interfaces: https://youtu.be/DNfgbqH9csM

Pricing/Packages

Unknown/not listed.

Market segmentation

B2B.

Distribution Channel

Instell supplies products and software solutions for the electronics industry in which they are sold to the end-users.

4.2.3   Installatøren Gruppen AS

Installatøren Gruppen AS provides technical building services for private clients, entrepreneurs and public sector

URL: http://installatoren.as/smarthus/

Products

Fibaro Home Automation system: http://installatoren.as/smarthus/fibaro/ or www.fibaro.com/sca/the-fibaro-system

A control system, which offers intelligent control of electronic equipment such as lighting, heating, media and electronics, by the use of different sensors and modules.

Features:

- Fibaro Home Center – the central unit which controls all the sensors and modules (displayed on PC, tablet or smartphone).
- Controlling the home by means of speech.
- Integrated GPS monitoring – which estimates the time of arrival at home.
- Lighting control.
- Heating meals.
- Opening windows.
- Opening curtains.
- Temperature control.
- Dimmer.
- Video monitoring.
- Lock/unlock doors.
- Making coffee.
- Water sensor.
- Smoke detector.

YouTube Video: https://youtu.be/K35uFXoa5c0

FIBARO motion sensor: http://installatoren.as/smarthus/fibaro/fibaro-bevegelse-sensor/

YouTube video: https://youtu.be/R_I2p1Tq2QU

Features:

- Multi sensor for motion, temperature, light and accelerometer.
- Colour signalization: Multi colour LED indicates movement and temperature changing.
- Long lasting battery – enough to power the sensor for 2 years.
- Count the guests/the amount of people entering and leaving the house.
- Motion alert.

Pricing/Packages

Unknown/not listed.

Market segmentation

B2C.

Distribution Channel

Installatøren Gruppen AS delivers technical building installations (solutions and services) for private clients, entrepreneurs and public sector.

Observations and considerations based on the Google search

There are a lot of suppliers of smart home technologies in Norway, which offer solutions not only for elderly or people with disabilities, but for everyone. Many of the suppliers offer the same features (e.g. temperature sensor/control), technologies (e.g. sensors), solutions (e.g. control systems with mobile user interface) and also the same standards (e.g. KNX) and producers/ brands (e.g. Micromatic, Scheider).

Some examples of similar and competing smart home suppliers in Norway are (based on Google results):

- PK-service: www.pk-service.as/58966/
- Svithun Elektro AS: www.svithun-elektro.no/smarthus.html
- Storm Elektro: www.stormelektro.no/automasjon/smarthusauto
- Autobolig AS: www.autobolig.no/?gclid=CPuo4aKCrsgCFWezcgodAZMAGw
- Micro Matic: www.micromatic.no
- Bygg-Automasjon AS: http://bygg-automasjon.no
- Vanpee AS:Error! Hyperlink reference not valid.
- Carlo Gavazzi: www.gavazzi.no
- Smart-house solution: www.smartbuilding.no/for-installatører.html
- Eide systemintegrering: www.systemintegrering.no
- Elektrikerservice
- Elektroidé AS: www.elektroide.no/smarthus.html

Other welfare technology

Source: Innovatoriet, Høgskolen i Buskerud og Vestfold (a Norwegian college/university): http://innovatoriet.hbv.no/getfile.php/innovatoriet.hbv.no/Filer/8.4.15%20Liste%20produkter%20og %20leverandører%20Innovatoriet.pdf

4.2.4   Dignio

Supplier of welfare technology

URL: www.dignio.no

Products

Medical measuring equipment, with different sensors that can send medical results and acute messages to caregivers or healthcare. The different devices can measure:

- Body weight, specifically muscle mass, bone mass, fat and water.
- Body temperature.
- The degree of saturation of haemoglobin with oxygen (SpO2), including pulse.
- Blood sugar.
- Blood pressure.

The amount of air and the rate of air inhaled and exhaled over a certain period.

It also includes **Pilly** – a medicine dispenser, sending message to contacts that medications are taken or not taken at the right time (see image to the right).

My Dignio (on a tablet) is the primary users´ own page where they can find their daily activities and the results of their latest medical measurements.

MedTeam App (on Android mobile device) gives healthcare professionals an overview of all their patients at once, and easy access to detailed information. All the information about the patient is collected in one place.

Dignio Prevent – a solution for preventive medicine – is a software system for healthcare contact centres, which follow up patients and users who have alarms, sensors and medical measuring equipment at home. Dignio Prevent is available for PC, Mac, iPad and Android tablets, as well as iPhone.

Message system for families/caregivers allows the caregivers to receive messages when certain incidents are recorded in the system (e.g. high blood pressure, not taken medicine, etc). They can receive messages through SMS or e-mail, or both.

Dignio home centre and mobile centre provide the information exchange between the home and Dignio, and can be displayed on an Android tablet.

Dignio Safety Package consists of:
- Mobile alarm service
- Fall detector sensor with safety alarm (a bracelet)
- Motion sensor – Detects unusual movements in the home (e.g. when a person with dementia is on the way out at night), and can also be linked to lighting controls.
- Fire alarms and other types of alarm that can detect burglary, water leaks, and control power and lighting.

- Doro mobile safety alarm, built with large, simple keys adapted for people with impaired sight.

Tracking/GPS solution with associated sensors and support systems that can provide people with dementia a safer and more active life. A GPS gives each user more freedom of movement, and gives relatives/caregivers a better overview.

The trend seems to be technology that is present without the user being aware of it (e.g. fall detector sensors). Technology that contributes to self-reliance can also help reducing concerns of the families.

Pricing/Packages

Unknown/not listed.

Market segmentation

B2B and B2C.

Distribution Channel

Dignio supplies products and services for public sector (municipalities, hospitals, nursing homes) and private users.

4.2.5   Careto - Supplier of tracking and welfare technology

Careto is an independent advisor and provider of tracking and welfare technology. This means that we are free to use the best products on the market when we put together and recommend solutions for our customers.

Careto specializes within 3 areas: Care sector – Safety for children – Personal Security

Safety and security is fundamental to human life. Careto aims to provide technological solutions to the healthcare sector, which are easy to use. The users are central - not the technology!

URL: www.careto.no

Products

Solutions for GPS-based safety alarms and assistive technologies, containing:

- Personal tracking devices (different types of GPS trackers)
- Map and administration solution
- Layout for tablets, smartphones and desktop PC
- Finished layout adapted to users
- Education: Instructional videos, documentation and initial courses
- User service by phone and e-mail
- Technical support

Video in Norwegian can be seen here: www.careto.no/47/

Pricing/Packages

Careto offers customized solutions with different technologies, based on individual (or organizational) needs. The pricing will therefore vary. However, Careto runs the web shop www.tryggereliv.no with some single products and prices. Here are some examples:
- Mobile safety alarm with GPS and fall detector: 213 Euro

- Careto Pro – Mobile safety alarm with GPS and fall detector: 266 Euro
- GL505 Waterproof GPS tracker: 181 Euro

Market segmentation

B2C.

Distribution Channel

Careto provides complete solutions for small and large institutions, and home care services for almost 50 Norwegian municipalities.

4.2.6   Safemate – a mobile personal alarm

URL: www.safemate.no

Product

Safemate is a mobile personal alarm with GPS tracking and GSM. If help is needed, the user presses the alarm button. Immediately up to four pre-defined alarm recipients are called in parallel. The first recipient to respond is connected with the Safemate, as in a regular phone call. When it is clear who responded to the alarm, this information along with Safemate position is sent to all alarm recipients. Safemate can be worn by children, elderly people and anyone who wants extra security.

English video on Vimeo: https://vimeo.com/86296286
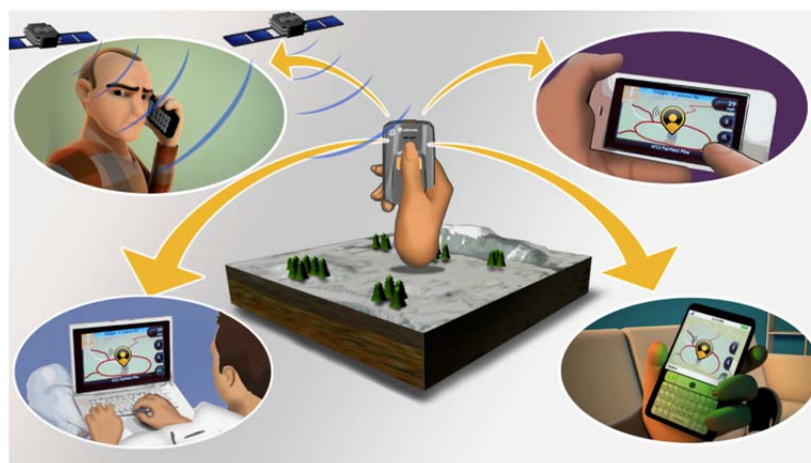
Pricing/Packages

Private market: The price for Safemate in Norway is 995,- Norwegian Kroner (NOK) (108 Euro) (including VAT). Prices in other countries may vary. The Safemate comes with a set monthly

subscription fee. Subscribers may sign an optional service that ensures professional alarm response 24/7/365. All users must accept our terms and conditions.

Business: The price for Safemate in Norway is 1,599,- Norwegian Kroner (NOK) (173 Euro) (excluding VAT). Prices in other countries may vary. The Safemate comes with a set monthly subscription fee of 129,- NOK (14 Euro)(excluding VAT).

On the webshop (www.safemateshop.no/butikk/) the price for Safemate is 1,999 NOK (217 Euro).

Market segmentation

B2B and B2C.

Distribution Channel

Safemate can be bought on the following webshop: www.safemateshop.no/butikk/.

Safemate can also be bought on an electrical shop (Elkjøp), a pharmacy (Vitus Apotek), and a security shop online (www.sikkerheten-selv.no).

4.2.7   Vestfold Audio

Electronics Company that develops and produces demand-driven welfare technology

URL: www.vestfoldaudio.no

Products

- **FlexiLife** is an integrated notification system that watches over elderly people in their everyday life, facilitates communication with family, friends and health services, and makes the public support system more effective.
- **FlexiBlink detection system** is customized with smoke detectors, stove guard alarm, water leakage guard with alarm, passage detectors, warning receivers and bed vibrators, depending on the property's condition and personal needs. All smoke detectors and sensors / transmitters are addressable for increased security. FlexiBlink is stable and secure even during a power interruption and regardless of Internet and external resources. FlexiBlink also offers notifications to neighbours. FlexiBlink is a wireless alarm system, and it connects wirelessly to the FlexiLife system.
- **FlexiLife Notification** receives all alarms and alerts from FlexiBlink. The notification setup can be customized to the individual user´s home and life situation. Typical setups are: walking at night, leave home at night, do not come back to bed, has not been in the fridge, lack of movement in the house, situation for security alarms, etc. Flexi Life Notification communicates with the "outside world" through SMS, sound signal and to some apps.

Pricing/Packages

Unknown/not listed.

Market segmentation

B2C (most likely).

Distribution Channel

Uncertain. The web contains detailed product information, but it seems to be no information about how to buy the products and what they cost.

4.2.8 Norsk Telemedisin AS

supplier of tele medicine and video communication

URL: www.norsktelemedisin.no

Products

Nattfred (in English; night peace) is a service of camera supervision for users who need nightly supervision or extra care and safety in their homes. Nattfred works in total darkness, and can capture movements, which gives an alarm/message to caregivers. Families or care personnel performs camera supervision through a computer program (Windows).

Nattfred is developed by JoiceCare AB in Sweden.
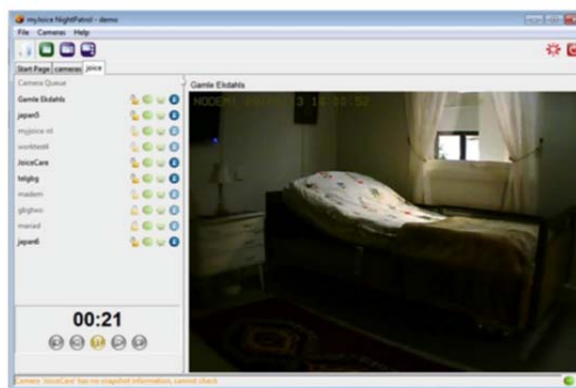
Pricing/Packages

Directly translated from the web page: Nattfred is a subscription system. It can either be rented or bought. Currently this is only a service offered to municipalities or companies that are responsible for care services/supervision. Please contact us for price offers. In addition there is an hourly price for travel, installation and training. This will be prearranged.

Market segmentation

B2B

Distribution Channel

Nattfred is a service offered to municipalities or companies that are responsible for care services/supervision.

Nära (in English; close) is a video communication system that allows the user to watch and talk with others by using their TV. The system consists of a videophone that connects to a standard TV. The carer/friend/relative on the other end may use a PC, tablet or smartphone with webcam and headset. The elderly uses a remote control to call and receive phone calls. If the person is not available for a JoiceCare call, the call is diverted to a predefined phone.

Nära is also developed by JoiceCare: www.joicecare.se.

Swedish video on YouTube: https://youtu.be/J8-uybU586Y

4.2.9   Abilia

Developer and supplier of assistive technologies

URL: www.abilia.com/nb

Products

Memoplanner – a digital calendar with reminder function, for people who need help to remember appointments and structure their day, week and month (displayed on small and large tablets).

Features:

- SMS text / sound: Send and receive regular text messages, which are pre-written.
- Dictaphone: Four different Dictaphone messages á 30 seconds is available.
- My photos: Save your own photos to be used as communication and memory support.
- Countdown: Distinct visual countdown with timeline or digital countdown.
- Skype

Handi Xcover – A package that includes the smartphone Samsung Galaxy Xcover 3 and the software Handi5 SW. Handi is an assistive technology that function as a cognitive support in the everyday life and helps the users to structure their day and routines.

Features: Album, Notes, Checklist, Form, Form Reply, Calendar, Contacts, Emergency plan, Price calculator, Voice messages, SMS, Quick settings, Games and Telephone.

HomeBasic i2 – A safety package for those who have a complex need in time and memory support, environmental control and notification.

Features integrated:

- Memoplanner, clearly calendar with images, text and reminders.
- Sensors that e.g. tells if the user leaves the house with the stove on
- Prevention of falls, with night light that automatically turns on
- Simplified video phone/Skype for increased social contact
- Webcam
- Photo album
- Countdown to activities
- Memo planner has touch screen and can function as an electronic photo frame when it is hanging on the wall

Price/Packages and Distribution channel

Abilia supplies their products to a centre for assistive technology, owned by NAV (the Norwegian Labour and Welfare Administration). People who have a permanent need, can borrow assistive technologies from NAV, free of charge. The price that NAV pays for the products is unknown.

Market segmentation

B2B.

4.2.10 Mylife products

URL: www.mylifeproducts.no/en/

Product

Memas – memory assistant for people with dementia – a product based on the AAL project Mylife (coordinated by Karde) as well as other research projects.

YouTube video with English subtitle: https://youtu.be/0ywyUlUe96U

The following can be displayed on the user tablet:

- Day, date and time
- Whether it is day or night
- Appointments and reminders today

- Calendar, you can choose between a day at a time, one week at a time or a month at a time
- For joy: e.g. memos, photographs, newspapers, radio or weather forecast
- Contact me

On `carer web` the carers can make settings and select the content that fits the interests and desires of the individual user. The user may enter appointments directly on the tablet.

Price/Package

- **Subscription for 12 months without tablet:**
- 160 NOK (17 Euro) pr. month. Startup cost: 1500 NOK (164 Euro).
- **Subscription for 6 months without tablet:**
- 180 NOK (20 Euro) pr. month. Startup cost: 1500 NOK (164 Euro)
- **Subscription for 6 and 12 months including tablet:**
- Same price pr. month, but a startup cost of 4500 NOK (491 Euro)
- **Subscription for 1 month without tablet:**
- 350 NOK (38 Euro). Startup cost: 0. Discount when extension.
- **MEMAS Maxi including tablet:**
- 325 NOK (35 Euro) pr. month for one year. Startup cost: 0.

Market segmentation

B2C.

Distribution channel

Supplies the product to private users and the public sector such as municipalities and nursing homes.

4.2.11 Lyse

Industrial group operating within the fields of energy and fibre-based broadband

Lyse supplies electricity, fibre-optic broadband, Altibox Internet and TV services, and smart house.

URL: www.lysekonsern.no/?lang=en_GB

Products

Smartly is Lyse's new focus on making the home safer, simpler and more eco-friendly. The customer controls the lighting, heating, alarm and many more home functions from a single remote control in a tablet computer or smartphone.

www.smartly.no

Smartly Welfare offers solutions that provide safety, relief and services that make it possible to live at home. The user-friendly welfare solutions facilitate activity, participation, independence and coping.

- Lightning and heating control
- Motion sensor
- Fire and burglar alarm
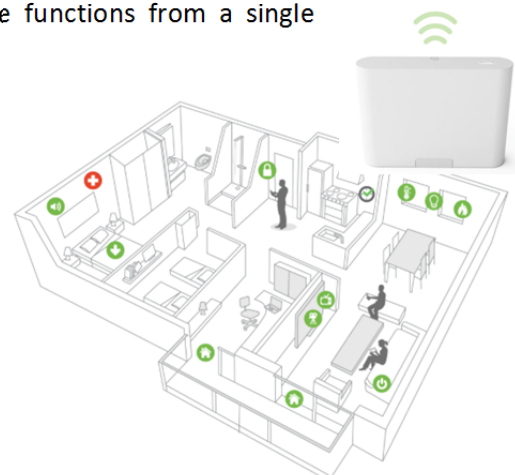
- Different information from different sensors in the home will be sent in real time via secure communication solutions to Lyse Smart operating center that can handle timed alarms and combined alarms.

Price/Package

Unknown price, includes installation.

Market segmentation

B2C.

Distribution channel

Smartly supplies solutions to both private users and public sector. They have specific solutions and services specially developed for and in cooperation with the public sector. Their consultants can assist in efforts to detect the users' needs, and have special expertise in welfare technology for public services.

4.2.12 Sensio

Supplier of welfare- and smarthouse technology

URL: www.sensio.no

Cooperates with Lyse Smart (described above) and supplies products to Smartly Welfare, among others.

Welfare technology – that will give professional carers the opportunity to use their time on the most important part of the job – the humans.

Smart house technology – that gives you a complete control of your house via mobile, tablet or the Internet.

Products

Mobile duty room – A central solution for receiving, distributing and escalating patient alarms from institutions and residential.

The professional carers can use mobile devices, large alarm panels or a browser. The set up can be customized per institution, department or residential.

URL: www.sensio.no/velferdsteknologi/mobilt-vaktrom/

Sensio Smart house – a standard solution from xComfort and Sensio, using the standard programming tool xSetup.

Features:

- Directly transfer from supervision cameras
- Intuitive lightning control, to be set up in different scenarios
- Full overview and control of heating system, with time setup
- Control of blinds and curtains
- Notification on mobile in case of deviations or errors

- Weather forecasts from Yr.no straight into the user interface

URL: www.sensio.no/smarthus/

Price/packages

Sensio offers by far the easiest, fastest and most intuitive programming solution on the market (…) The Sensio systems should be finished programmed within one day. This helps to make Sensio a cost-effective solution.

Market segmentation

B2B.

Distribution channel

The systems are sold through Sensio´s partners, which are 750 electrician companies with more than 2,500 electricians who have been trained in the system Xsetup. Sensio have business partners in Germany, Switzerland, Netherlands and Spain.

4.2.13 Dips

Largest supplier of electronic patient record systems to Norwegian hospitals

DIPS ASA is the dominant player in the Norwegian healthcare sector with the largest customer base in the EPR field. We are the largest supplier of Radiology Information Systems and the second largest supplier of Laboratory Information Systems.

Products

DIPS EPR (Electronic Patient Records) is a sturdy, reliable system, running 24/7 across the country in 73 % of Norwegian hospitals. In fact, five of the seven university hospitals in Norway use DIPS EPR, providing vital functionality to 57,000 professional users.

The DIPS EPR systems cover a wide range of products:

- Electronic Health Records
- Nursing documentation and treatment planning
- Integrated EPR scanning system
- Medication and prescriptions
- Workflow and process management
- Electronic Document Interchange (HL7 and XML)
- Booking and operation theatre management
- ….and much more…

Price/packages

Unknown.

Market segmentation

B2C

Distribution channel

Supplier of eHealth systems to the Norwegian health care sector.

4.3 Sweden

4.3.1 Nattfrid, Joice Care

A service offered only to companies or municipalities responsible for care services.

Price: About 1,500-2,000 SEK

URL http://joicecare.se/tjanster/nattfrid/

Strengths
- More efficient use of resources
- Provides increasing care quality
- Provides increased safety for the patient and the caregiver
- Optimal user interface
- Environmentally friendly

Included in the service
- Motion-sensitive camera
- Software for caregivers that can be installed on any PC

Other services
- Nattfrid can be orderd with or without the service Close to TV-Phone
- Nattfrid can be ordered with or without broadband
- Broadband is needed in order for the service to work

Technical details

Packages

- 1 JoiceBox – remote control
- 1 BlackBox – blackbox
- 1 Webbcamera,
- 1 SCART-cable
- 2 Adapters
- 1 Manual for installation

Technical information
- Network: 10/100M RJ-45 or WIFI IEEE 802, 11 B/G
- TV: SCART
- Power: 12V AC, 500mA
- Camera: USB
- Total weight: 1.9 kg

Supervision at distance: Products and services for older persons and persons with disabilities.

For technical details see: www.caretech.eu/carephones-range.htm#.Vm5NBU1IheU

CareIP

A carephone that communicates via an open SIP based protocol adapted for communication over IP and Next Generation Networks. The device connects into a domestic router, like a computer and works using broadband provision offering simple and easy installation. The advantages to both service users and service providers is that communication with the response centre is instant, an alarm call hits the operator's screen in seconds. CareIP is always on line and any failure of the communications link will be instantly reported. One other significant feature is that all calls using a broadband connection are free.

CareIP Mobile

CareIP® Mobile is a carephone which uses both GSM/GPRS communication and IP. In the event of the broadband being disabled the CareIP Mobile will convert to using GSM/GPRS communication until the broadband is enabled. This 'belt and braces' approach combines two separate communication networks and provides a level of security far above traditional analogue devices. CareIP Mobile can also operate solely as GSM carephone. The carephone is not tied to any network provider and a low cost SIM card is mounted securely in the device. This enables the installation of an alarm where the client does not have a telephone line. This is a growing problem in the UK due to friends and families purchasing mobile phones for their loved ones which leads to them not requiring a telephone line. The CareIP Mobile is compatible with all 2G mobile phone providers and is completely future proof. It also has the option of connection via the internet at a later date and therefore a secure future is then assured for clients and end users.

Alarm trigger Elliot

Auto test function - The alarm trigger can be programmed to automatically send information to the carephone related to battery life and range to ensure that the user is always able to make a call.

Waterproof - The alarm trigger is waterproof to the IP67 standard.

Status LED - Visual call indication and confirmation of battery life and other programmed functions.

Life time low cost savings - the alarm trigger can have the battery changed by non-technical member of staff. The battery type is CR2430 Lithium 3V and once changed the pendant is waterproof as it contains a specially designed seal. This provides big savings when compared with a typical pendant exchange.

'Easy Click' Accessories - Neck cord, wrist strap, belt clip and the unique Easy Press Button for people with limited dexterity.

Dual Button - Five different actions can be programmed

Dual frequency transceiver - Transceiver transmits on a dual frequency of 868/869 MHz European social alarm frequency providing the ultimate protection against interference from other radio devices.

CareTech Sense

CareTech Sense is a whole family of products that can be combined to create tailor-made solutions based on the individual's needs.

Fallsensor

CareTech Fall Sensor is a device that is worn on clothing via an integral clip or placed in a specially designed waist belt on the torso.

www.caretech.eu/fall-sensor.htm#.Vm5UXE1IheU

Nemo Motion Sensor

Bed monitor, raise an alarm when end user leaves their bed.

Inactivity sensor, register end users movement so if they have not been in their kitchen for a day it will raise an alarm via the carephone (in combination with the passive alarm function in the carephone).

Presence Sensor used with door alarms e.g When the end-user opens a door and then returns to their home within a certain time, the door alarm will reset automatically.

Door Alarm to inform an Alarm Receiving Centre, carer or even family member that the end-user who is prone to wandering has left their home

www.caretech.eu/nemo.htm#.Vm6LOk1IhIk

Smoke detector

The CareTech Smoke detector is battery operated with a built-in transmitter designed for CareTech systems and carephones.

www.caretech.eu/smoke-detector.htm#.Vm6Mbk1IhIk

Repeater, Radio transmitter, Door alarm

mBox 869MHz:

repeater amplifies the radio signal between wireless alarm transmitters and security alarm

www.caretech.se/produkter/product5/

radio transmitter is used to supplement fixed alarm sensors to wireless. When a patient cannot push on a portable emergency button, an assistive devices can easily be connected to mBox Radio

www.caretech.se/produkter/radiosandare/

door alarm

www.caretech.se/produkter/dorrlarm/

Care Tech Sense

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CareTech Sense is a whole family of products that can be combined to create tailor-made solutions based on the individual's needs. A wide selection of alarm sensors, such as Bed Sensor, Chair Sensor or *Pressure Mat can be connected to Sense mBox to enable wireless* monitoring of beds, chairs, floor areas, doors etc...

www.caretech.eu/sense-sensors.htm#.Vm6WWU1IhIk

Bed sensor   Chair sensor   Pressure mat

Epilepsy alarm   **Voice alarm**

Wandering client sensor

Elvis is an easy-to-use wrist worn alarm transponder and Gustav is a low frequency (RFID) device. The devices can be used in conjunction with dementia related conditions to prevent the potentially hazardous situation of the end-user suffering dementia. leaving an assisted living environment or their own home. The Elvis alarm transponder will trigger an alarm to the Alarm Receiving Centre via the carephone when the user passes through a door or restricted area (where Gustav RFID would be located). Time parameters can be set e.g. between 9pm – 6am. The Elvis alarm transponder also acts as an alarm trigger to allow for the end user to call for assistance in an emergency.

www.caretech.eu/wandering-client.htm#.Vm6X1E1IhIk

Supervision at distance

Doro Care, Doro Secure 681 IP, Doro Secure 680 IP, Doro Secure 580 IP

Different mobile phones with GPS-postions, easy to read and use.

4.3.2 Tunstall

Product

- Careline GSM, Careline IP/GSM och Careline IP.
- Digital carephones

An important feature is the link-test-function, which controls the connection between security phone and alarm transmitters, as well as two-way communication with active alarm acknowledgment - everything to ensure a high level of safety. Careline Anna / GSM can transmit both alarm with or without voice connection, up to 10 different pre-programmed alarm receivers via the analogue telephone network and / or GSM network. Careline GSM can also send alarms to 8 different alarm receivers via GPRS. Alarm Recipients will then send alarms through to as cell phones, local wireless telephones or an alarm center depending on time and day. Dialing to the various alarm receivers is done through a predetermined sequence, and may differ depending on the type of alarm. The carephone is equipped with both microphone and speaker, and works as a speakerphone, which allows conversations without further key press by the user in addition to the alarm activation. The call

can be supplied in a standard sized apartment with good sound quality. The Alarm Transmitter Tx4 can change frequency and transmit on another frequency if it would be interference on the primary frequency.

www.tunstallnordic.com/sv/produkter/tunstall-produkter/trygghetstelefon-careline

www.tunstallnordic.com/sv/produkter/tunstall-produkter/trygghetstelefon-caresse-gsm

Mobile Care

When the alarm button on the Mobile Care is pressed, an alarm is transmitted to the control centre, such as Tunstall Control Centre or the municipality's own alarm reception. The alarm receiver and the user can then communicate with each other.

- Simple to use; only an alarm button and an on / off button
- Very accurate positioning
- Energy efficient; at least 24 hours of battery life
- Full duplex hands-free communication
- Hybrid System telecare, indoor and outdoor
- Escalation chain for emergency calling to up to five predefined telephone number
- Automatic SOS Alarm (gps fence)
- Handsfree communication with highly sensitive microphone / speaker
- Positioning and tracking via PC and mobile phone
- Active Dock with magnetic mount for easy charging
- The text-based communication protocol that is integrated with the control centre
- www.tunstallnordic.com/sv/produkter/tunstall-produkter/mobilecare

Caresse Mobile

On Caresse Mobile there are four buttons for optional speed dial numbers to alarm receivers. When the alarm button on Caresse Mobile pressed an alarm is transmitted to the control centre, such as Tunstall Control Centre or the municipality's own alarm reception. The alarm receiver and the user can then communicate with each other. Caresse Mobile has built-in positioning function with GPS. Caresse Mobile can also be used as safety for people working alone. Fall detector and passive alarm is also a function built into Caresse Mobile.

www.tunstallnordic.com/sv/produkter/tunstall-produkter/baerbar-trygghetstelefon-caresse-mobile

Internsystem Accent and Internsystem Accent IP

Accent is an intercom system developed for sheltered housing and special housing in the care of the elderly and disabled. The system is developed for special housing and dementia care facilities. Accent receives and controls the alarms automatically as decided by themselves. Apartment unit contains a speaker and microphone. It also has buttons for the presence selection, alarm reset, emergency personnel, etc.

www.tunstallnordic.com/sv/produkter/tunstall-produkter/internsystem-accent

www.tunstallnordic.com/sv/produkter/tunstall-produkter/internsystem-accent-ip

"**Larma hela huset" – alarm in the entire house**

A solution that works in both major facilities and in private accommodation. It enables complete coverage of most property and its immediate surroundings as patios and in gardens.

www.tunstallnordic.com/sv/produkter/tunstall-produkter/larma-hela-huset

Lifeline Vi+

A user-friendly carephone

www.tunstallnordic.com/sv/produkter/tunstall-produkter/lifeline-vi

Sensors

- IR-sensor/Motion sensor
- Smoke sensor
- Flood detector
- Gas detector
- Temperature sensor
- Stove guard

Assistive devices

- Bed alarm
- Larmmatta
- Epilepsisensor
- Inkontinenssensor
- Fallsensor
- "Easy to press" buttons
- Voice-/sound alarm
- Sip- & blow alarm
- Pingpong-/cheek alarm

Technical systems for alarm, etc.

- Internsystem CareCom
- Larmmottagningsprogram PNC Evita
- Mobillarm
- Cobs Alert C-3110
- CareLock
- Nattro

Emergency buttons

- Alarm sender Tx4
- Alarm sender TX75
- Portabel emergency button MyAmie
- Portable emergency button GEM
- Fallsensor
- Carino emergency button

Transmitter module
- T-box 869

4.4   Switzerland

Direct Competition

Primary Competitors

According to the information retrieved from secondary research there already exist a few companies developing ICT based solutions in Switzerland, including domestic enterprises and international corporations. Secondary Competitors

As informed during the interviews, Spitex in Ticino is currently working with a research company called IDA-SUPSI who targets the elderly people living at home in the Swiss Italian part. Their study focuses on prevention of accidents and injuries as well as telemedicine, E-health, ICT and rehabilitation.

Even though IDA-SUPSI develops very similar products and concept, it is still considered as a secondary competitor for the fact that it is a non-profit organization 50% financed by the General Confederation and Cantonal contributions and 25% by direct mandate.

Furthermore, Swisscom and Limmex are another two secondary competitors, since their core businesses are not directly related to the elderly people. Swisscom is one of the largest telecommunication companies in Switzerland, who provides the "TeleAlarm®S12" as their emergency solution. Limmex is a company producing luxury emergency watches for different groups such as children, athletes, elderly people, workers and patients. Both of them will compete with DOMO Safety in the elderly people's market.

4.4.1   Parcom System AG

URL: http://www.parcom.ch/

Company Size: 26 employees

Target Market
- Retirement Homes
- La Post
- Hospitals

Product

Hands/Feet button, bed sensor, carpet sensor , mattress with sensor, panic button, necklace alarm, watch alarm, alarm with positioning of person, GPS person tracker, watch with positioning information, easy telephones, statistics software

Price

From CHF55 to CHF2,900

4.4.2   Ascom

URL: www.ascom.com

Company Size: 1,900 employees worldwide

Target Market

B2B

Product

- Critical Alarms: for emergency accidents
- Nurse Call: With a wireless telephone, the nurse can speak directly to the patient and immediately assess his or her needs
- Resident Services: Perhaps the greatest benefit to residents of an Ascom wireless solution is reassurance.
- Technical Alarms: a wireless communications system gives quicker response to alarms from indoor climate systems, lifts, doors, windows, lighting, etc.
- Wanderer Control Solution: can keep a discreet eye on patients/ residents – with no effort at all.

4.4.3   Adhoco

URL: http://www.adhoco.com

Target Market

- Home owners
- Real estate professionals
- System Integrators and installers
- Utility companies

Product

- Central unit
- Sensors
  - Wireless presence and illuminance sensor
  - Wireless temperature and humidity sensor with setpoint input
  - Solar-powered mini meteo station
- Actuators
  - Radio-controlled radiator valve
  - Control unit for 6 floor heating valve groups
  - Radio-controlled power switch
  - Radio-controlled universal dimmer
  - Universal Mobile Light Switch
  - Panic button / power switch for alarm transmitter
- Accessories
- - Remote control for one room
- - Door connector
- - Adhoco. mobile application

- OEM products (Products for the integration in systems and solutions of other providers)

4.4.4 2PCS

URL: http://www.2pcs.eu/

Company Size: 85 employees

Target Market
- Elderly people
- Care organizations

Product
- Web 2.0 services platform
- Call centre contact
- innovative, watch-like device
- Location - based information
- Emergency aid
- Sensors functionality
- Voice communication
- Geo/cardiac tracking of sport activities

4.4.5 Solem

URL: http://www.solem.us/

Company Size: 85 employees

Target Market

B2C

Product
- TELE-ASSISTANT
  - STC1 solution: used by home assistance providers and call centres offering services to municipalities, insurance and complementary insurance companies, and by anyone with reduced motor abilities or who is in a physically dependent state
    - A phone console (mains-powered STC1S)
    - A wireless call medallion
    - ACCESSORIES:
      - Universal sensor module
      - Calypso smoke warning detector (tactile contactor in particular)
      - Vital Base fall-detector (Telecom Design)
      - Carrousel electronic pill-dispenser (Ithaq)
    - STC1-GPRS: STC1 transmitter, equipped with a GPRS modem that operates without the need for a traditional PSTN analog telephone line.
- MOBILE READERS
  - SBO4: Handheld terminal for managing home services
  - SB05: Customizable mobile terminal

4.4.6 Bosch

Target Market

B2B and B2C

Product
- Telecare / Personal Emergency Response Systems and NurseCall Systems:
- Carephone
- Carephone Accessories
  - o Wireless Transmitter
  - o Wireless Detectors
  - o GSM Gateway
- Social Alarm Management System
- Nurse Call System (under development)
- Nurse Call Accessories (under development)
- Nurse Call Dementia (under development)

4.4.7 Intervox

URL: http://www.intervox.fr

Target Market
- Private Home
- Nursing and Residence Home
- Home Care:
  - o Yana +: Telecare terminal through telephone line
  - o Yana GPRS: solution to the evolution of the new telecommunication media
  - o Yana Europe: Telecare terminal through telephone line
  - o Visiovox: the family pack
  - o Prevention tools:
    - ▪ Environmental detectors (flood sensor, smoke and CO detectors, dangerous gases detectors, temperature detectors)
    - ▪ Presence and activity Detectors
    - ▪ Universal transmitter connected to medical devices
    - ▪ Remote radio intercom module
- Nursing and Residence Home:
  - o Yana + NRH: Telecare terminal
  - o IDENTIF +: optional module for care and service monitoring

4.4.8 Birdy-Technology

URL: http://www.birdy-technology.com/

Target Market

B2C

Product

- Birdy Box (Birdy the Box is an innovative solution for providing a service Helpline no need to connect to the telephone network (PSTN).)
- Pills Birdy Box (Insurance to meet its treatment, without the risk
- to forget, to deceive or to be assayed).
- Birdy Angel (Communication device and GPS geolocation GSM, GPRS IP Transmission KEP64, Call or SMS to pre-programmed numbers, reception of all incoming calls, emergency call button, loss detection by vertical accelerometer)
- Birdy Box 100T (allows the observation of a patient at home by telemonitoring.)

Indirect Competition

Retirement homes are considered to be an indirect competitor since their target market is the elderly people as well and their core business is to take care of them constantly.

4.4.9   IDA-SUPSI

URL: http://www.supsi.ch/home_en/ricerca.html

Target Market

B2G

Product

- Robots that help blind people
- Information on the status of the house
- Detect environmental parameters
- Light table
- Sensors windows
- Closing / Opening Auto. Door sensors,
- Activity Sensors (wireless)

4.4.10   Swisscom

URL: http://www.swisscom.ch/

Target Market

B2C

Product

TeleAlarm®S12 (outdoor watches)

Price

CHF 34.50 monthly renting price while CHF 699 purchase price

4.4.11   Limmex

URL: https://www.limmex.com/

Company Size: 15 employees

Target Market
- Children
- Elderly people
- Athletes
- Professionals
- Health Care

Product

Emergency luxury and design watch. The watch works both indoors and outdoors and loudspeaker is build-in in order to directly speak to the person selected in the contact list.

Price

CHF 34.50 monthly renting price while CHF 699 purchase price

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