Get Ready for Activity – Ambient Day Scheduling with Dementia

Exploitation Plan

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Preface

This document forms part of the Research Project "Get Ready for Activity – Ambient Day Scheduling with Dementia (GREAT)" funded by the AAL 2016 "Living well with dementia" funding program as project number AAL-2016-023. The GREAT project will produce the following Deliverables:

D1.1 Medical, psychological, and technological framework

D2.1 Applicable hardware components

D2.2 Applicable software components

D2.3 Field tested hardware components

D2.4 Field tested software components

D3.1 Implementation report

D3.2 Field test report

D4.1 Communication strategy

D4.2 Stakeholder management report

D5.1 Report on market analysis

D5.2 Dissemination plan

D5.3 Final business plan

D5.4 Exploitation plan

The GREAT project and its objectives are documented at the project website http://uct-web.labs.fhv.at. More information on GREAT and its results can also be obtained from the project consortium:

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Executive Summary

At mid-term of project duration, the GREAT system and its components - the luminaire as well as the sound and scent modules - , are almost market-ready. The industry partners already have a clear idea about how to approach the market, of the customer segments they want to address, possible distribution channels and cost structures.

Although various issues such as the licensing costs and the exact type of support services to be offered still have to be defined, the business models for the two main customer segments, i.e. nursing homes or special care units and private households, are in the process of being developed in close cooperation between the industry partners and end-user organisations.

Field trials have already started in the gerontopsychiatric clinic in Austria and a nursing home in Italy and are about to start in Switzerland in two main settings, namely:

1. Fixed installations in nursing homes and specialised care units (SCU)
2. Mobile installation targeted at private households

As far as mobile installations for private customers are concerned, we consider leasing as the most attractive option given the dynamic progress of the disease.The results and feedbacks from end-users, i.e. people suffering from dementia (PwD and their (informal) caregivers, will provide insights into acceptance, benefits and possible gaps/shortcomings of the system and help us refine the various modules.

Whilst the main target group remains people with dementia living in their own houses or in nursing homes, the project partners are aiming for a much larger market. The GREAT solution and the luminaire, in particular, is also relevant to settings and scenarios that demand a high degree of attention regardless the time of day, e.g. people engaged in shift or night work in hospitals, or people engaged in visually demanding tasks in offices. As shown by the positive feedback from ÖSV, the Austrian Ski Association, athletes and anyone interested in fitness and vitality can also benefit from the GREAT luminaire in terms of increased alertness and wellbeing.

We are confident that we can overcome existing market entry barriers by offering a range of support services to (potential) customers including advice, configuration, installation as well as support via app, which increases the market potential of the GREAT solution considerably since integrating app control makes it independent of time and place. Besides, we are considering a range of business models – Suppliers of single components, Single point of contact&access, Coordinator/Orchestrator - that are aligned with the needs of our customer segments.

Currently, we are not looking for reimbursement from insurers or health authorities, but focus on creating value propositions that help relieve customers' pain points and respond to their needs so customers are willing to pay, esp. since we intend to offer flexible payment models including leasing. In the field trials we hope to demonstrate measurable impacts on the quality of life of both PwD and their formal and informal care-givers.

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Figures and Tables

Role of the Deliverable

This deliverable is intended to provide insights into our approach for entering the market and achieve a successful exploitation of the project results. It should give a good perspective on the activities and investments required to address the different customer segments for the GREAT solution as a whole as well as with the individual modules. It also shows the key dependencies with other work packages within the project and gives guidance to the overall project to make sure that everything that is developed will be exploitable. It does not report on academic and non-academic dissemination activities of the results of the project such as conferences, contacts to potential partners, exhibitions, etc. These are discussed in the Deliverable 5.2 Dissemination plan.

It is based on the following internal documents:

- GREAT Proposal and the related Description of Work
- A 1-year student project about technological support for people with dementia and their caregivers, which also included looking at possible business models[1]
- A master thesis about technical assistance systems for people with dementia[2]
- A study commissioned by CURAVIVA on the acceptance of AAL solutions by end-users[3]

The Exploitation Plan is furthermore related to the following deliverables:

- D5.1 Report on market analysis
- D5.2 Dissemination plan
- D5.3 Intermediate business plan

We have also consulted the recent report "AAL Market and Investment Report" prepared by the *technopolis group* in May 2018[4], as well as specific reports related to the lighting industry, e.g. the White Paper on Human-Centric Lighting[5] , the study prepared by A.T. Kearney for LightingEurope and the German Electrical and Electronic

[1] Zoller, C., Bögle S. & Chiavi (2016). Technische Unterstützung für Demenzkranke und deren Betreuungspersonen. Unpublished Report, FHS St. Gallen.

[2] Bachofen, S. (2016). Technische Assistenzsysteme für Menschen mit Demenz. Unpublished Master Thesis, FHS St. Gallen.

[3] Technologiekonzept für das Wohn- und Pflegemodell 2030 (2016). Prepared by FZI Forschungszentrum Informatik, Karlsruhe,for CURAVIVA. Unpublished Report.

[4] Varnay et al. (2018). AAL Market and Investment Report. A study prepared for the AAL Programme (Active and Assisted Living) by Technopolis Group, May 2018.

[5] Human Centric Lighting: Going Beyond Energy Efficiency. Prepared by A.T. Kearney for LightingEurope and the German Electrical and Electronic Manufacturers' Association (ZVEI), July 2013. https://www.lightingeurope.org/human-centric-lighting.

Manufacturers' Association (ZVEI) and the presentations, also prepared by A.T. Kearney, on the quantified benefits of human-centric lighting.[6]

Apart from the use cases discussed in these reports, we also take into account the lessons learned from other AAL projects and initiatives such as the Flemish CareClouds, the Swiss network AGE-NT or the AAL Living Lab in the Lake Constance Region.

Besides, the results of various discussions and meetings between the consortium partners have found their way into this document. These relate to the marketing and sales strategy with regard to the luminaire, in particular, since the scent and sound modules play a minor role when it comes to commercial exploitation.

As far as the GREAT solution as a whole and associated after-sales services are concerned, we are awaiting the results of the various field trials that are in progress. The should provide us with further insights into the needs and expectations of end-users, both in private households and nursing homes.

There is some overlap between the deliverables D5.1, D5.3 and D5.4 since all of them deal with the market potential, drivers and barriers for AAL solutions, value chains and business models to some extent. However, the emphasis is different: in the **Market Analysis** we focus on the overall market potential for the GREAT solution, its components, technologies and services involved. It also discusses relevant markets and customer segments, recent market trends and developments. In **the Intermediate Business Plan** we discuss to what extent the original assumptions have been validated and if we have to revise the original plan as presented in the business model canvas, and if so, why and how.

The **Exploitation Plan** sets up the environment for commercialising the outcomes of the GREAT project. It presents the exploitable outcomes, both products and services, discusses the GREAT value propositions for different customer segments and their respective requirements and settings and finally, it sets out strategies for entering the market and overcoming the market barriers that still bedevil so many AAL solutions.

[6] Quantified benefits of Human Centric Lighting (April 2015). Presentation prepared by A.T. Kearney for LightingEurope and the German Electrical and Electronic Manufacturers' Association (ZVEI), https://www.lightingeurope.org/presentations/180-quantified-benefits-of-human-centric-lighting-april-2015

1 Exploitation approach

1.1 Introduction

1.1.1 Market potential and opportunities

The potential market for AAL solutions is enormous because the ratio of people in the EU that are aged 65 or above compared to the people aged 15-64 is expected to increase from 28% in 2015 to 50% in 2060. The AAL market is driven by demand pull, i.e. the rapidly growing population of the elderly, on the one hand, and technology push, i.e. the development of new ICT solutions, on the other hand. The AAL market has been attracting the interest by the ICT industry, service and care providers and investors in general.

The authors of the Technopolis study (Varnay et al., 2018) see opportunities in the AAL market primarily in combining different types of technologies into new and innovative solutions that support independent living of older people. Moreover, they note that there is increased interest in **solutions that keep people active and healthy**, rather than focussing on treatment. AAL solutions that integrate simpler sensors, e.g. wristbands, and data processing technologies, and artificial intelligence are more likely to have market potential.

Opportunity areas may include smart emergency calling systems, personal assistants (at home and outside), intelligent monitoring systems, simple communication services, information platforms that make information and elderly care-services easily available for informal carers and gives them the support to organise themselves, platforms that help building up and supporting caring communities. For example, a platform that tries to connect informal carers to care specialists to help release the care burden.

Since solutions have to be tailored to specific geographical market segments, opportunities for smaller companies arise, especially if these are well established in the respective regions and are well connected with the relevant stakeholders, as in the case of our industry partners.

A specific challenge to old age is **dementia** and almost 6% of the EU population over 60 years of age suffer from dementia. It is estimated that the number of people with dementia will increase from 10m in 2015 to 13m in 2030 and 19m in 2050[7]. In Switzerland alone about 200'000 individuals are estimated to suffer from dementia. As we know, age is the most important risk factor for dementia. Whilst in the age-group between 65 to 79, less than 2% are affected, this goes up to about 13% in the age-group of 80 – 84. About two thirds of those who suffer from dementia are over 80 years old, and in Switzerland, the population of 80+ is predicted to grow 2.5 times by 2045.[8]

[7] Prince, M., Wimo, A., Guerchet, M., Ali, G. C., Wu, Y. T., & Prina, M. (2015). The global impact of dementia. *World Alzheimer Report*, 1-82.

[8] http://www.bfs.admin.ch/bfs/portal/de/index/themen/01/03/blank/key/ind_erw.html

Depending on the severity of their symptoms, people need varying levels of support. Besides, it is not only person living with this disease, but also their formal and informal care-givers who are affected by the disease and require support.

We can therefore conclude that the market potential for the GREAT solution is considerable and that its most relevant customer segments, i.e. PwD and their caregivers, are set to grow.

1.1.2 Market barriers

Most developers of AAL products and services, however, have found the AAL market quite challenging and only a few products and services have been successfully commercialised. This has been attributed to a lack of effective user involvement, the **fragmentation of the market** and the differences, e.g. in language, culture and capabilities. AAL solutions tend to be offered across Europe by many small enterprises, which hampers efforts to implement innovation at scale.

Also, given the **different regulatory schemes, cost models and market segments** in the participating countries, the customer value proposition has to be differentiated to satisfy customers. According to the Technopolis study, the lack of platforms based on open standards is also one of the most significant market barriers within the ICT industry.

In the Section on Moving towards commercialisation, we will discuss how we intend to overcome these barriers. For the time being, let us point out (as already done in the proposal), that in our project we follow the recommendations formulated in the Final Evaluation of the AAL Programme from 2008 - 2013, namely:

- Stretch the AAL value chain and aim for scale by implementing pilots and operating under real-world conditions
- Enrich the AAL ecosystem by involving lead customers, new models of co-creation and living lab solutions
- Reinforce the market orientation by explicitly addressing market entry and commercial exploitation.

1.2 Exploitable outcomes

In this section, the aim is to identify the technical and non-technical outcomes that have potential for business exploitation, and to determine whether they can be exploited separately or as a whole.

1.2.1 GREAT Luminaire

The GREAT luminaire comes in four variations: free-standing with symmetric or asymmetric light distribution, ceiling-mounted, wall-mounted. A flexible spot can be additionally added to all versions. The modularity of the GREAT luminaire allows different use scenarios which increases the market potential considerably.

BFS - Zukünftige Bevölkerungsentwicklung – Daten, Indikatoren - Schweiz Szenarien

As a result from feedback during the test phase, protection against accidental bending has been added as well as bipolar radiation which opens up new applications such as high-performance table or room lighting.

Currently, the GREAT Luminaire has the following USPs:

- System for activation and relaxation by using of different light colours
- Biodynamically controlled light curve to stabilise the day-night rhythm
- Excellent, beautiful, extraordinary luminaire design
- Uplight with extraordinary single or double asymmetric radiation for even light distribution across the whole room
- Downlight with plane light distribution avoids glare perception
- Lamp can be optionally equipped with up to two spots
- Also suitable for demanding visual tasks and increased visual requirements
- Luminaire can be combined with scent, sound and sensor technology (aspects of well-being and health) (complete system)
- Simple operation via push button
- Upgrade via app
- 5 years warranty on components

Figure 1: Free-standing floor luminaire

Based on the conclusions of the market analysis conducted by Bartenbach, it is above all the **free-standing luminaire** that differentiates the GREAT lighting solution from similar smart lighting products. It can easily be moved around and is therefore highly

flexible in its use, which takes into account the changing demands of this customer segment.

1.2.2 The scent module

The GREAT scent module is a scent dispenser for two different scents. It is automatically activated by the GREAT control system when an activating or relaxing atmosphere is to be created in the room.

Figure 2 shows the individual components of the scent module. Each scent module can hold two pump sprays. The left shaft is for activating scents, the right shaft for calming or relaxing scents. When delivered, Primavera scents can be used in 100ml bottles - however, other brands and sizes can also be used on request, provided the dimensions do not exceed the size of the shaft.

The scent module requires a 230V mains voltage connection.

Figure 2: Components of the GREAT scent module

Main unit (a), cover (b), filter attachment (c), USB power supply (d), Micro-USB connection cable (e), relaxation scent (f), activation scent (g) and optional bottle adapter (h) for 30ml Primavera scents.

1.2.3 The sound module

The GREAT sound module is used to fill a room with activating or relaxing sounds. The sounds are pre-set by the GREAT control system. Figure 1 shows the individual components of the sound module. The sound module consists of a pair of speakers

with integrated electronics, a USB power supply and covers to prevent accidental volume adjustment. The sound module requires a 230V mains voltage connection.

Figure 3: Components of the GREAT sound module

Pair of speakers with integrated connection cable (a), cover panels (b), USB power supply (c).

For more detailed information, please consult the Instruction leaflet, Version 1.0.2 (20.6.2018), which is only available in German.

Apart from the light, scent and sound modules, the following services may be considered exploitable outcomes:

1.2.4 Exploitable Services

Support

Any type of support provided to developers or users of the GREAT system. This includes customer support, technical support, or any kind of service support required for the elderly in general and PwD or their caregivers, in particular.

Data Mining

This refers to collecting, aggregating and mining information related to user habits, interactions with the system. Such data can later be used for non-technical reasons, such as health-monitoring or marketing, as well as for technical reasons, such as improvement of the hardware and software components, etc.

Care-giver Exploitable Outcomes

These outcomes are in a separate category due to the fact that GREAT focuses on care-giving and assisting elderly people, esp. those with dementia. These could be commercialised as an ongoing service to the users, e.g. by a provider of care services.

Health Monitoring

Monitoring the health of an elder user, either passively or pro-actively. Through the usage of 3rd party devices such as a wearable sensor, important information could be relayed to the physician or nurse of the elderly. This, in combination with a monitoring service could provide a highly sophisticated, low latency alerting system, and further alleviate monitoring and care-giving costs, usually attributed to human personnel.

Dementia Prediction & Detection

In the long-term, it may be possible to predict and detect dementia based on information captured from system interactions. If for example, a user starts forgetting things, or is constantly asking the same questions, that information in combination with other data (as e.g. from wearables) might be highly predictive for an (onset of) dementia. In that case physicians or care-givers can be alerted to the condition of the system's user. This exploitable outcome could drastically cut costs of the care-giving industry, whilst maintaining an accurate image about the user's mental health.

2 The GREAT value propositions

Whilst the different components such as the luminaire, the scent and sound modules can be marketed separately, it is their integration into an overall solution that will reinforce the impact on wellbeing and quality of life of end-users.

The GREAT system as a whole will not only provide a tailored solution to support the daily structure of PwD and their caregivers but also adapt to the necessities that accompany dementia as a progressing disease in particular settings.

Therefore, the modular concept and easy integration into existing smart automation systems as well as the fact that we provide **a packaged solution for leasing in home settings and an individually planned system for care facilities** are key value factors for our modular persuasive ambience solution.

The unique selling points of the GREAT system can be summarised as follows:

- Positive effects on the wellbeing of PwD by enabling meaningful activities (as specified by end-users) via three senses (seeing, hearing, smelling) simultaneously to create an ambient effect
- Enhanced quality of life of formal and informal carers, e.g. by reducing agitation
- Room ambience system fitted to individual requirements and/or systematically controlled in line with therapy plans
- Valuable information about the patients for caretakers and physicians based on data collected by sensors as well as observation (dementia care mapping)

- A modular and extensible system – modules (light, sound, scent) can be easily added or removed without incurring any additional installation effort
- A single point of contact for (potential) customers ranging from advice, configuration, installation to support and maintenance for both technical and disease-specific issues
- Scalable and flexible solutions that adapt to changing user needs in line with the progress of the disease,
- Solutions that are adapted to different requirements and settings (low-level, low-cost and mobile for private households vs. high-end and stationary for nursing homes or specialised care units), and
- Easy handling of system with just 2 buttons (activation vs. relaxation)

Value propositions also have to match with the expected gains and benefits of specific customer segments. Table 1 provides an overview of the different customer/market segments that are connected to AAL solutions.

Table 1 Overview of AAL product and service categories and markets

AAL categories and definitions	
• Health & Care • Information& Communication	• Comprises products and services which collect and manage medical data, which support therapy and care activities, as well as those assisting in nutrition and personal hygiene. • Comprises products and services which one the one hand side present knowledge, offer advisory functions and on the other hand support and enable interpersonal communication and organization of daily living.
• Living & Building • Safety & Security	• Comprises products and services for water and energy supply, light management, room climate as well as measures for design barrier-free rooms. Maintenance and access control are in this category, • Comprises products and services, which prevent damage and burglary or which support the user in case of falls. Localisation and emergency management is part of this category.
Mobility & Transport	Comprises products and services that on the one hand serve as transportation measures for persons and goods and, and on the other hand offers travel information, navigation and orientation solutions.
Vitality & Abilities	Comprises products and services that support, train or enable basic physical, mental and social abilities that are essential requirements for independent living.
Leisure & Culture	Comprises products and services, which enrich or enable recreational activities in leisure time and cultural activities. Sports, media and games are covered as well as culture, religion and travelling.
Work & Training	It contains work supporting measures and products and services for job specific learning and training.

Apart from Health & Care, which is our primary customer/market segment, the GREAT system and its components will also be of interest to other markets, for example those related to Work &Training, Living & Building and Vitality & Abilities.

In the following section, we discuss the benefits of the GREAT solution and its components for the Health & Care industry, which is our main target market.

2.1 Health & Care Market

The health and (basic) care sector is characterised by needs. This means that there are limited financial resources available in this space because investment is often directed towards cure and rehabilitation solutions, and not towards care. Technology in the active and healthy ageing market is often viewed as 'a nice to have technology, not a need to have technology.' Therefore, it can be quite challenging to find investors as medical solutions often take precedent over solutions that focus on wellbeing and improving the quality of life for older adults.

Before we describe the benefits and the expected impacts for the different target groups in more detail, we would like to summarise the results from a study commissioned by the umbrella organisation for nursing homes CURAVIVA on the acceptance of AAL solutions from an end-user perspective[9]. These are supplemented with learnings gained from developing AAL solutions and working with senior citizens in previous projects.

Together they form the basis for the **customer profiling**, which, however, does not focus on PwD, but on elderly citizens in general.

- Heterogeneous target group: Elderly people do not form a homogenous group of people but are rather characterized by a tremendous range of interests and needs.
- Changing demands: Requirements change in the course of time. This is indicated by a different distribution of customer demands within different age groups and can be explained by declining physical and cognitive capabilities as one gets olde.r
- Comfort-orientation and convenience: Elderly people appreciate comfortable solutions that are easy to handle. Approximately 50% of elderly people state that they have problems handling technical equipment but also with goods of daily need like packaging of groceries.

As a result of the target group's **heterogeneity** a tremendous range of different services need to be offered, preferably by a single point of contact. These have shown to be fundamental to the acceptance of any AAL solution including the GREAT system.

Customers appreciate **comfortable and convenient** solutions and are no longer willing to take over the complexity of coordinating numerous partial solutions. Each service as well as their integration must be situational, taking the specific conditions of the environment into consideration. For example, a sensor for preventing falls should not cause an alarm if a person is lying on the floor because of the daily gymnastics.

[9] Technologiekonzept für das Wohn- und Pflegemodell 2030 (2016). FZI Forschungszentrum Informatik, Karlsruhe. Unpublished Report.

Also**, customer demands change in the course of time**. Successful solutions must be able to adapt along with these changes, preferable on their own, since these changes in demands often occur steadily and unconsciously as is the case with dementia.

Finally, the customer demand for convenience on the one hand and the complexity due to different components or wide-spread services on the other hand, lead to a need for automation up to the level the individual customers desires. This requirement is further intensified by the fact that ageing people often have to cope with upcoming impairments such as dementia.

This can be compensated by **automated support,** e.g. by automatically adapting the lighting so as to get people into the mood for walking, eating, interacting or sleeping as envisaged by the GREAT project.

2.1.1 Benefits for end-users

The benefits for end-users /end-user organisations can be summarised as follows:

Depending on the setting, the beneficiaries include

- People with mild to moderate dementia
- informal care-givers, usually family members in the case of people with mild dementia still living at home, or
- formal care-givers such as nurses and other personnel in nursing homes specialised on dementia

The main benefits for people with dementia:

- Increase in the quality of life –
  This is measured by self-reported assessments and Dementia Care Mapping (DCM), a structured, observational assessment of dementia patient experiences developed for use in customerial care settings with patients who are unable to provide valid and reliable reports themselves. DCM is therefore more appropriate for use with severely impaired patients (see Rahman, 2014:43).
- Facilitate the participation of people with dementia in daily activities and social interactions.
  This is assessed mainly by observations of the study nurse and from feedback of the staff in the participating nursing homes.

For informal and formal care-givers

- Reduction of stress and improvement of sleep quality in the case of care-givers

  This is being measured by means of an upper-arm sensor developed and provided by the Swiss company Biovotion. In addition to many other vital parameters, the sensor measures heart-rate variability (HRV), which is a well-proven indicator for stress.

2.1.2 How to increase acceptance

To ensure better acceptance and also actual use of the technical support systems, various approaches have been put forward by the interviewees:

- Basic training: When a new system is installed, care should first of all be taken to provide them with a comprehensive introduction to the technologies used in their homes and other areas and not simply to leave them alone with the technologies.

- Technology pilots: This could be implemented in the form of a central contact person for technology-related questions in the neighbourhood/region of customers. On request, a brief introduction to individual technologies could be provided, queries about use could be answered, support with personalisation, e.g. of SmartHome configurations, or rapid help could be provided in the event of problems with the technologies.

- Instruction leaflets: Another approach would be to explain the technologies used in the nursing homes or private households, either in detailed written form with a series of explanatory pictures of the individual steps or also in animated form via video, comparable for example to the safety instructions in airplanes.

- Peer group training: Another possibility is the mutual support of the customers among themselves. It is conceivable that technology-savvy customers might already offer introductory courses in individual technologies for other customers. This could also promote social interaction.

- App-based training: Another possibility is training in the use of technologies directly via specially installed applications.

The possibilities described are not mutually exclusive, but can be combined to ensure optimum support for customers in their use of the available technologies. In the GREAT project, we have so far implemented the **Basic Training** approach when installing the GREAT system in the homes, and we have prepared various **Instruction Leaflets** for handling the different components (which are only available in German for the time being).

Based on the feedback from the field trials we may consider additional training options.

2.2 Other customer segments

Whereas the value propositions for the Health & Care sector are related to the GREAT system as a whole, the following discussion on other potential markets is focused on the GREAT lighting component, which will be marketed as a **"health luminaire**". The focus on the GREAT luminaire is justified by the fact that the luminaire as a stand-alone product has the largest market potential as has been demonstrated in the market analysis conducted by Bartenbach and emt ag.

The analysis compared the standing luminaire developed in GREAT project to similar products of other competitors and has shown that the GREAT health luminaire has

unique selling points which make it highly competitive in the **Work&Training** as well as the **Living&Building** sector.

Office workers and employees engaged in **visually demanding tasks,** in particular, stand to benefit from the GREAT luminaire. Further application scenarios can be found in the educational sector, e.g. to help activate pupils or students when they get sleepy or calm them down when they get too agitated. Basically, any setting or scenario where systematic control of light parameters may be useful is a possible target market for the GREAT luminaire.

2.2.1 Benefits for office workers

The GREAT luminaire can be subsumed under the category of **Human-centric lighting (HCL).** HCL enables consumers, retailers and utility management teams to help create the desired ambiance in adapting to a user's mood – almost instantly, while maximizing energy efficiency. It includes automated controls to simplify the environmental settings for places such as highly efficient commercial facilities, based on minute-to-minute levels of occupancy, and desired amounts of sunlight. HCL can be applied to any space that uses a lighting system, including homes, offices, retail outlets and even municipal infrastructure.

By adapting the light to the individuals' circadian rhythms, workers' alertness, vitality and cognitive performance can be improved. In 2017 the Lighting Research Center (LRC) at Rensselaer Polytechnic Institute[10] published a study showing that office workers who receive a robust dose of circadian-effective light experience better sleep, and lower levels of depression and stress, than those who spend their days in dim or low light levels. The research team found that even in open offices with many, large windows, office workers were not receiving enough light to stimulate their circadian system during the day, due to factors such as season, cloud cover, desk orientation, and window shade position.

The study's results showed that the office workers received significantly higher amounts of circadian-effective light while at work during the two intervention days compared to a baseline assessment day that preceded the intervention. The office workers' self-reported sleepiness scores were significantly reduced during the intervention days and, as hypothesized, they also reported feeling significantly more vital, energetic, and alert during that time. What is particularly remarkable is that the four independent office buildings all showed the same trends. These results demonstrated that lighting systems delivering a high amount of circadian-effective light, especially early in the workday, can reduce sleepiness in office workers while also improving their mood and alertness.

[10] See: https://www.lrc.rpi.edu/resources/newsroom/pdf/2016-2017/GSACircadian_8511.pdf

2.3 Expected economic impacts

In a survey conducted for formulating the Swiss Strategy for Dementia[11], it has been shown that about 50% of people who suffer from dementia are living at home and are cared for by their family members (2/3 by spouse or children) and friends or neighbours. The amount of care required depends on the progress of the disease and varies from selective interventions at the beginning (43%) to continuous round-the-clock care in 10% of cases when the disease is more advanced. Since the assistance given by family members and friends is normally delivered free of charge, we speak of indirect costs.

The indirect costs born mostly by family members are made up not only by the time spent on caring for their parent(s) or partner, but also the negative effect on their quality of life due to stress, social isolation and anxieties. Over 70% of informal carers would like or rather – are in need of - more assistance, especially when it comes to organising everyday activities. Day-care centres can play an important role to fill this demand.[12]

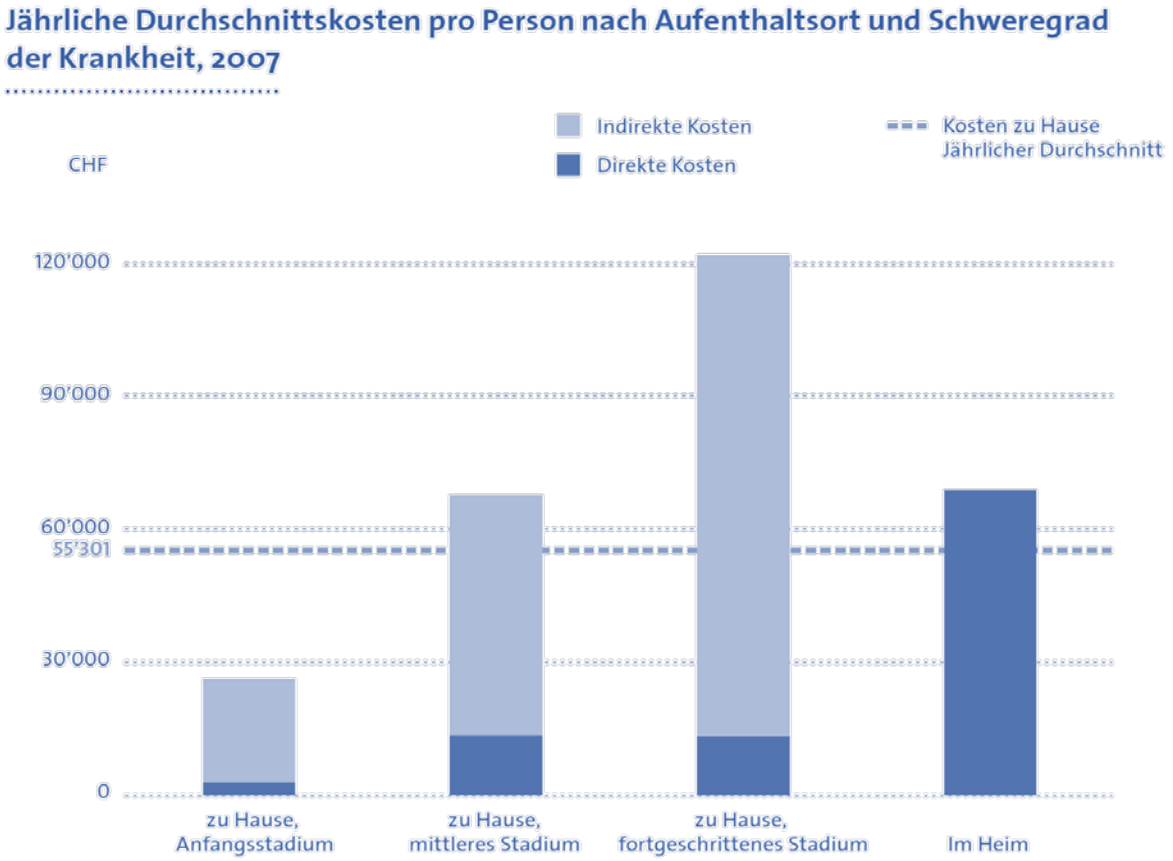


Figure 4 Average annual costs incurred by dementia

Source: Schweizerische Alzheimervereinigung (2010)

[11] Bundesamt für Gesundheit [BAG] (2013) Nationale Demenzstrategie 2014–2017 Nationale_Demenzstrategie_2014-2017_DE.pdf

[12] Kraft, E., Marti, M., Werner, S., Sommer, H. (2010). Kosten der Demenz in der Schweiz. Bern: Ecoplan

Figure 4 above shows the average annual costs per person depending on a person's location (at home vs. in a care facility) and the severity/progress of the disease in 2007

When people are cared for in a home, all the costs incurred are direct costs and these are substantial depending on the degree of care required. In Switzerland, these amounted to more than 60'000 Swiss francs per person per annum in 2007, the overall costs incurred by dementia to 6.3 billion Swiss francs. 90 per cent of both direct and indirect costs can be attributed to assistance and care (as opposed to diagnosis, treatment or medication) (Kraft et al., 2010).

Recent economic investigations about the cost of dementia show that care at home is cheaper at the early stage of dementia, reaches approximately the same level as care in a specialised care unit when the disease progresses, and actually is more expensive for a patient with advanced dementia.

As shown in Figure 4, care at home is cheaper at the early stage of dementia, reaches approximately the same level as care in a specialised care unit when the disease progresses, and actually is more expensive for a patient with very advanced dementia. These findings are confirmed not only for Switzerland but also for numerous other European countries (Kraft et al., 2010).

Depending on the country and on the different insurance regime, the direct costs are covered either by society at large or by the individuals affected (patients and their families) or by a mix of both. Since both the number of dementia patients and the associated costs will increase, any effort that contributes to cost reduction without jeopardizing the quality of life, autonomy or social participation of those affected, is welcome.

Figure 4 also shows that it is in the interest of society to support the **informal carers** because they carry the greatest burden usually without any financial remuneration and are at risk of serious stress, social isolation and eventually, burn-out. These indirect health costs including absenteeism of informal carers are normally not taken into account in official calculations.

This is why we measure the impact on quality of life not only with regard to those affected by dementia, but with regard to formal and informal carers as well.

For **Austria and Italy** we don't have precise figures related to dementia available, but since the prevalence of dementia is the same across different countries In Europe, the economic benefits will be similar (seeVarnay et al., 2018).

2.3.1 Quantified benefits in the health&care market

As shown in a recent market study "Human Centric Lighting: Going beyond energy efficiency" carried out by ZVEI, Lighting Europe and A.T. Kearney13, the quantified benefits of HCL are impressive.

[13] AT Kearney, Final results of "The quantified benefits of Human Centric Lighting", Frankfurt, April 2015
https://www.lightingeurope.org/images/publications/general/150420_From_Barriers_to_Measures_-_Final_Results_-_Complete_vF_004.pdf

For the Health&Care market they distinguish between

Medical

- hospitals, in particular corridors, recreation and ward rooms
- Focus on patients (and medical staff)

Residential (Elderly care, e.g. in nursing homes)

- Care homes for elderlies with and without physical constraints
- Focus on elderlies (and staff)

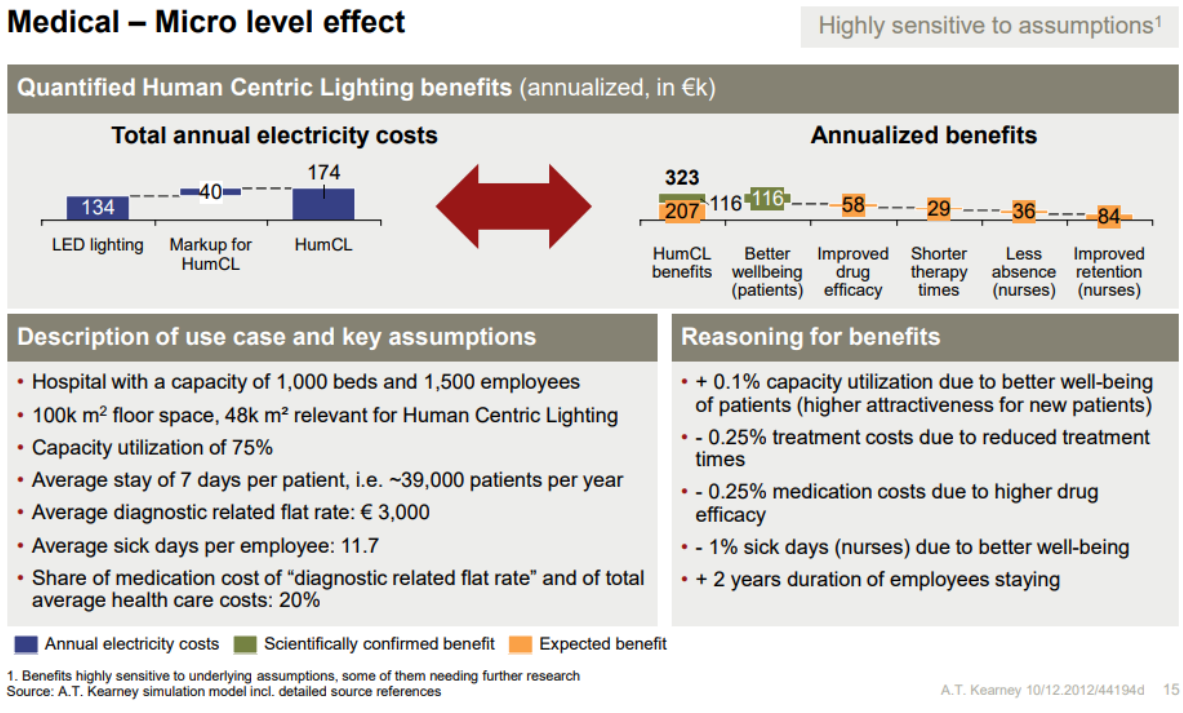
Residential (privat homes)

- Both own and rented flats and houses
- All income segments
- Including home offices

They simulated segment-specific economic benefits on micro and macro level using the following input parameters: Energize, Alertness, Cognitive performance, Circadian stability, Sleep quality, Mood and Relaxation (non-visual or biological benefits). Other parmeters taken into account: Labour cost, Typical error rates and Investment needs.

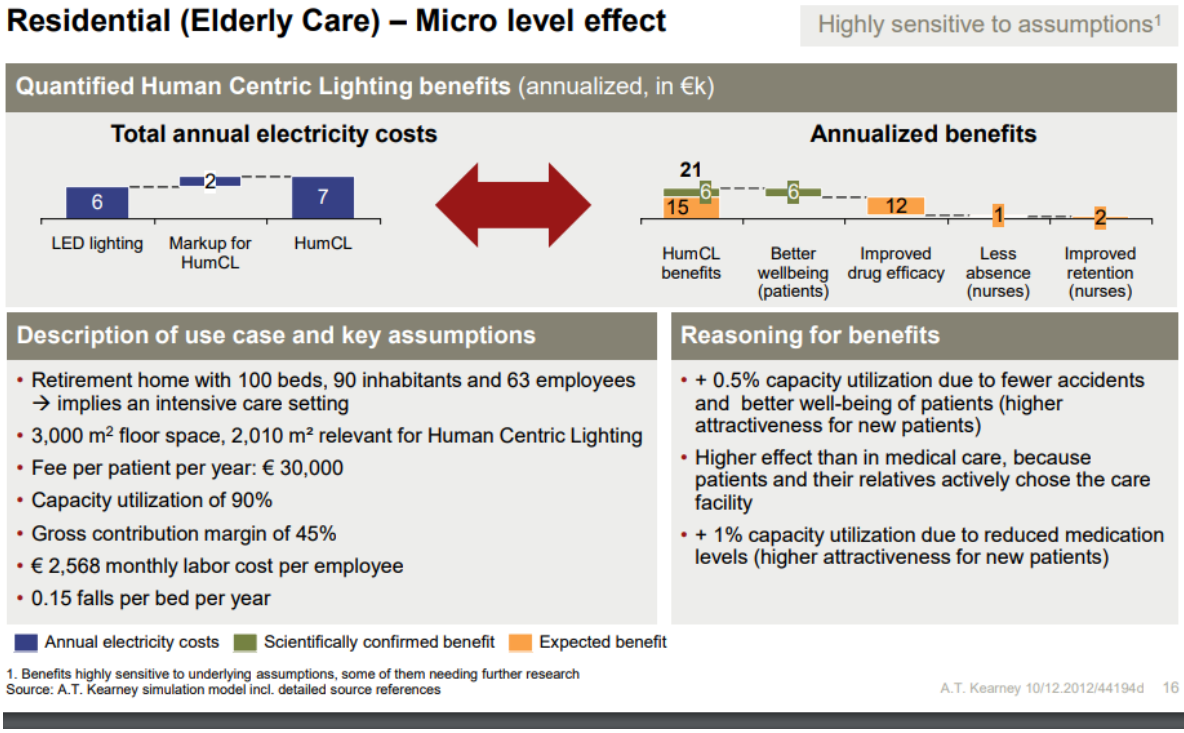
The Calcuation model distinguishes between the micro-level (perspective of individual investors, e.g. facility owners) and the macro-level (perspective of the general public, e.g. health insurances). For GREAT, the most relevant segment are Medical and Residential, both retirement/nursing homes and private homes. For these segements, A.T. Kearney expect the following effects.

At the micro-level

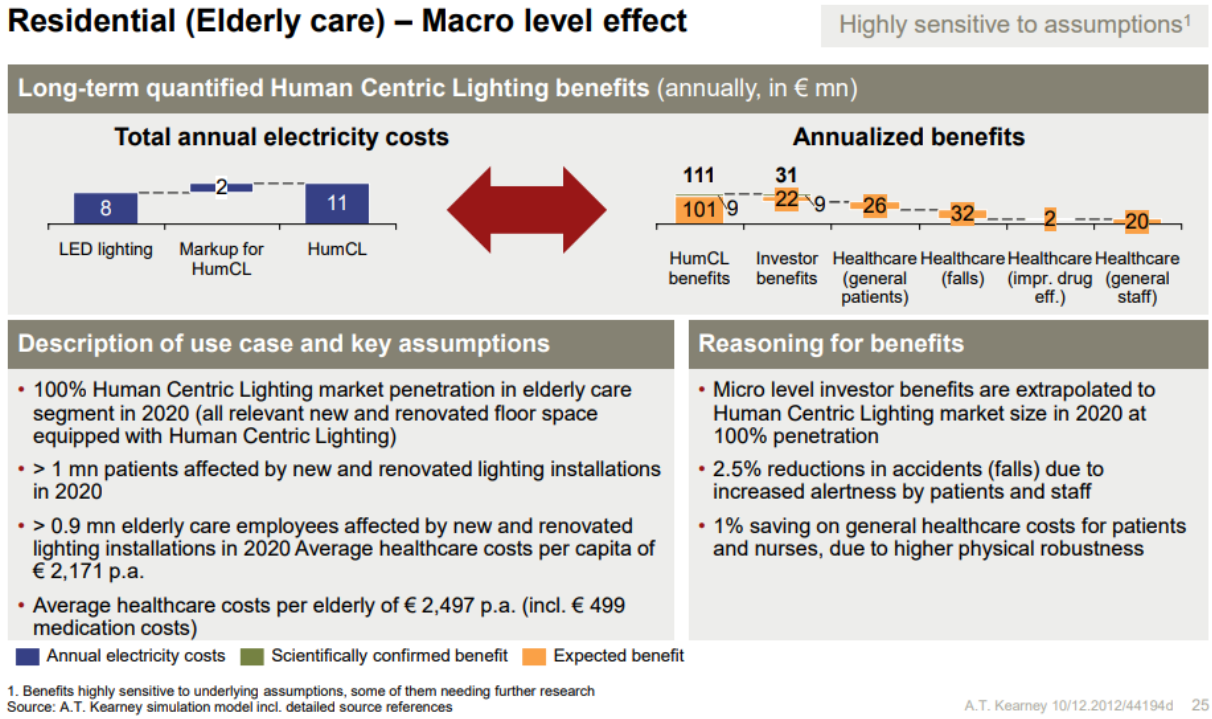


In the medical segment, several effects are expected, but are not well researched yet according to A.T. Kearney (2018).

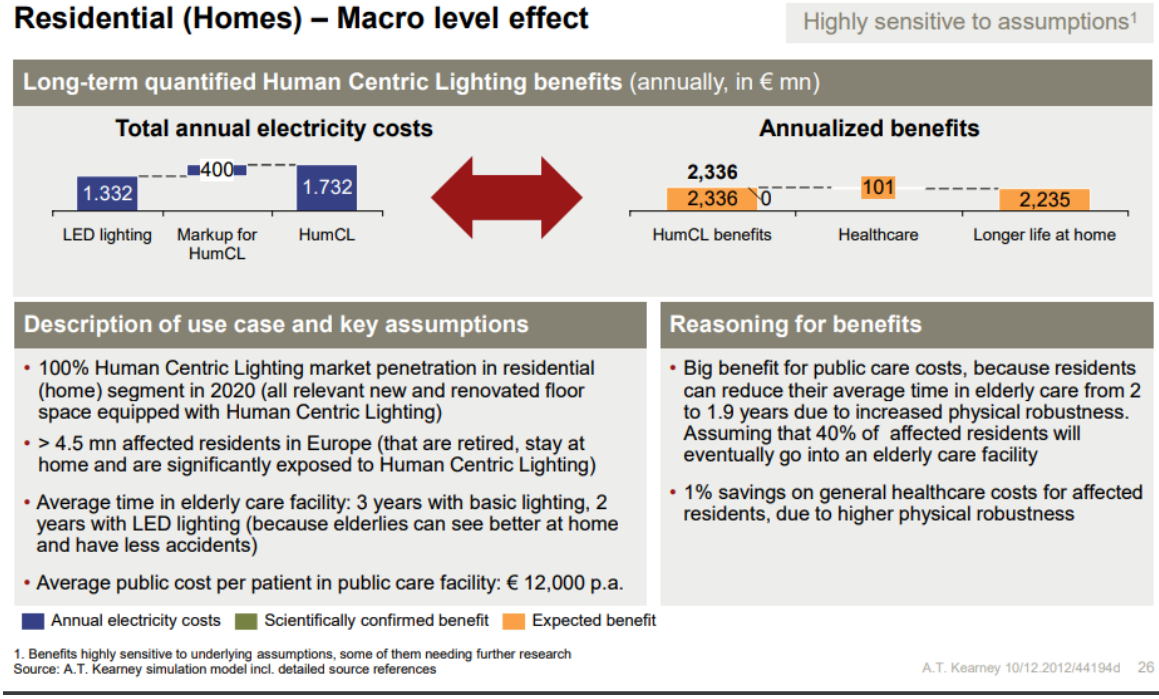
For retirement homes A.T. Kearney reckon that capacity utilization can significantly improve due to better well-being of residents **at the micro level**.



At the macro level, they expect there could be significant additional benefits for the public healthcare system



In the **residential privat home segment**, additional benefits are mainly driven by the **deferred need for institutional care** (see below).



The authors emphasize that in all cases benefits are highly sensitive to underlying assumptions, some of them needing further research.

In the case of residential care in nursing homes, for example, they specify the following use cases and assumptions at micro level:

- Retirement home with 100 beds, 90 inhabitants and 63 employees ◊ implies an intensive care setting
- 3,000 m2 floor space, 2,010 m² relevant for Human Centric Lighting
- Fee per patient per year: € 30,000
- Capacity utilization of 90%
- Gross contribution margin of 45%
- € 2,568 monthly labor cost per employee
- 0.15 falls per bed per year

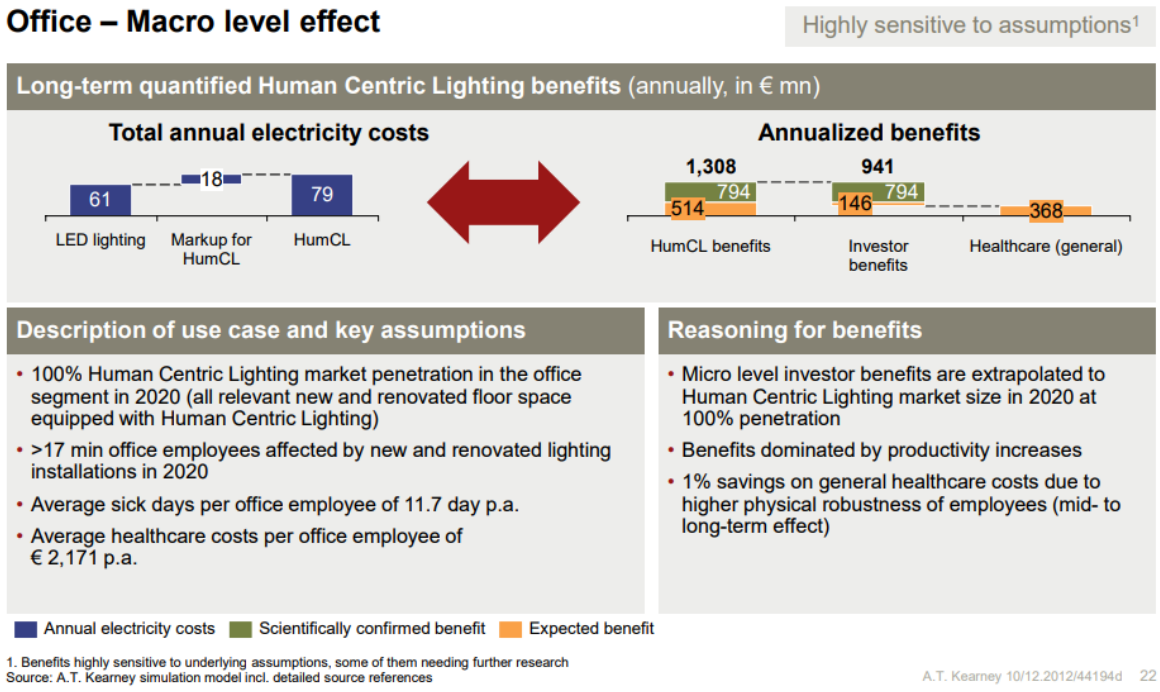
2.3.2 Quantified benefits in other markets

According to the authors **the most significant quantified benefits are realized in industrial segments due to the dominant impact of productivity increases** (micro-level, i.e. individual investors). Relevant applications in industry are repetitive, manual tasks as well as advanced manual work with little to some automation, e.g. tool making. In the office segment, increased productivity can result in significant labour cost savings due to higher productivity, fewer sick days and less flucation of staff.

The medical and elderly care segments show less attractive quantified benefits, as most savings cannot be realized by the investor, but by other stakeholders, e.g. insurance companies.

On the macro level (perspective of the general public, e.g. health insurances), simulations yield Human Centric Lighting effects for Europe in 2020 of up to € 0.87 bn assuming a realistic market penetration1 and € 12.8 bn if the 2020 lighting market was fully penetrated by Human Centric Lighting. They conclude that in most segments, benefits for owners and investors dominate. However, additional social and public benefits can also justify Human Centric Lighting markups.

In offices, they expect significant additional benefits to be realized for the public healthcare system:



In the case of GREAT, we expect both benefits for individual investors and social and public benefits.

In the following chapter we discuss how we intend to enter the market, how to appeal to different customer segments and which business models we have in mind.

3 Moving forward to commercialistion

There are many factors that need to come together until an AAL system finds its way to the market and is accepted by the end-users. Technology must be reliable and easy to use, end-users must see a value in the provided services and finally the system should be broadly available and affordable.

Despite the enormous market potential, the solutions developed in a large number of AAL projects have not really been taken up by the market. This can be attributed to market fragmentation as well as a lack of information and transparency, which results in a lack of market intelligence as pointed out in the final evaluation of the AAL Programme from 2008-2013. The final evaluation also stated that aspects such as interoperability, standardisation, harmonisation and transnational transfers should be

given more attention to intensify the market orientation and make results sustainable and achieve impact.

Besides, relevant stakeholders argue that clear business cases and evidence on social benefits would help to attract investors and convince economic and policy leaders.

In the GREAT project we have taken into account the recommendations put forward in the AAL Evaluation Report as well as the Technopolis study (Varnay et al., 2018) and have tackled the challenges as follows:

3.1 Overcoming market barriers

Market fragmentation

Barriers include naturally occurring obstacles such as cultural diversity, language, market size and geographic location. Therefore it is difficult to develop an AAL solution which is applicable to all areas of the EU, impacting marketability and investment prospects. Most experts suggest that an effective way to overcome such barriers is through **partnerships formed across borders**, be it with distributors or other intermediary organisations. Such organisations will offer services with connected technologies, lowering risk and enhancing access to consumers.

In the GREAT project, the cross-border cooperation with partners from three different European countries offers substantial added value, esp. because of the complementarity of the respective activities and channels to reach their customers.

Interoperability

Particular attention must be paid to the compatibility of the individual systems when selecting the various software components to guarantee communication and thus data exchange between the systems. We achieve interoperability by means of easy **integration with current bus systems** like EIB/KNX, LM, DALI, EnOcean, BACnet, MODBUS, Beckhoff ADS and EtherCAT and allowing different communication technologies like Ethernet, ZigBee, Bluetooth, WLAN. Besides, we implement a multi-layered, **modular software architecture** to ensure effective configuring, scaling, and servicing and use an open and documented plug-in-interface to give third-party developers the opportunity to create their own applications for the modular system.

Standardisation

Our system allows individual and easy-to-use control from different user interfaces (e.g. smart phone, tablet or desktop computer) and allows selected remote access to a limited number of persons from the internet (e.g. family members, caregivers, physicians). Therefore, seniors' activity measurements and interactive elements are visualized on these user interfaces following established usability and accessibility standards (e.g. ISO 9241, WCAG 2.0) and applying a **design-for-all approach**. It is feasible to perform data analysis, storage, and visualisation within a protected shroud of privacy, where the sensor data are controlled by their owners. For selected data exchange the cryptographic protocols such as encryption/decryption, digital signature, and hash code are used as protection mechanisms.

Transnational transfers

The solutions offered by Bartenbach are primarily aimed at larger public buildings such as hospitals, shopping centres, museums, bus terminals, airports etc., whereas EMT's products are targeted mainly at private consumers. In the project, both settings are relevant, which is why they can benefit from each other's experience and complement their respective product and service portfolios.

To achieve their strategic objectives, both companies are planning to extend not only their range of products but increasingly cover the whole value-adding process from design to support for the lighting solutions. For this purpose, they require expertise in integrating the lighting components with other modules, for example for fall prevention, emergency alarms, or security locks which is provided by INTEFOX.

At this stage it is still open if services, e.g. support, maintenance or updates can be delivered across borders. Different regulatory regimes may well be a stumbling block when it comes to services delivered face-to-face. However, by providing **support via app** we should be able to overcome this hurdle.

3.2 Market Entry Strategies

As discussed above, we are confident that we can overcome existing market entry barriers and that the GREAT solution fulfils the **prerequisites for a solid business case and successful commercialisation**, namely:

- **A proven demand in the marketplace**
- **Attractive value propositions and benefits for key stakeholders**
- **Trusted 3rd parties for customer access**
- **Focus on consumers' pain points**
- **No stigmatization thanks to highly attractive design**
- **The product is commercially viable (based on current cost estimates)**

Besides, the industry partners are convinced of the business opportunities and the product/solution is aligned with the companies' goals and strategies. In GREAT, all industry partners are highly motivated and capable of commercialising the developed solution. Each of them has a clear business case. As shown in Figure 5, the business cases and services are interlinked and integrated by Intefox.

The **strategies for market entry** can be summarised as follows:

- **Provide a highly interoperable, modular and flexible system we will:**
- **combine peer-to-peer network with server-based network to form a strong efficient portable and compatible network architecture**
- **allow easy integration with current bus systems like EIB/KNX, LM, DALI, EnOcean, BACnet, MODBUS, Beckhoff ADS and EtherCAT**
- **take care of hardware heterogeneity and allow different communication technologies like Ethernet, ZigBee, Bluetooth, WLAN**
- **implement a multilayered, modular software architecture to ensure effective configuring, scaling, and servicing**

- **use an open and documented plug-in-interface to give third-party developers the opportunity to create own applications for the modular system**

Figure 5 illustrates our strategy about how to enter the market:

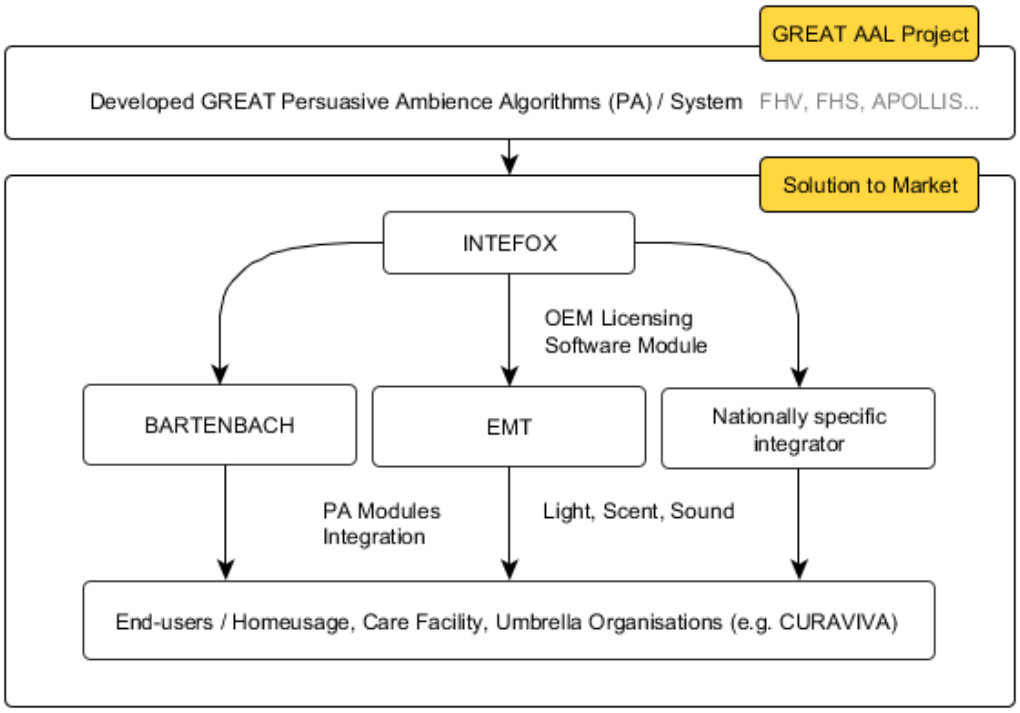


Figure 5: Market Entry Plan

As the solution relies on a modular technical concept, it can be expanded with other technical products, systems and functionalities to address different target user populations as well as individual users with differences in their cognitive, health-related or cultural needs.

3.3 Finding a viable business model

For defining a – or rather several – business models we have relied on

- partners' own experience and know-how of their respective industries or activity fields
- the results of the study conducted by Zoller, Bögle & Chiavi (2016),
- the business model categories suggested by Gersch & Hewing (2012).

Figure 6 shows the different business models in the AAL sector as defined by Gersch & Hewing (2012).[14]

14 See Gersch, M., & Hewing, M. (2012). AAL-Geschäftsmodelle im Gesundheitswesen-Eine empirisch gestützte Typologie relevanter Grundtypen ökonomischer Aktivitäten zur Nutzung von Ambient Assisted Living in sich verändernden Wertschöpfungsketten. In AAL-und E-Health-Geschäftsmodelle (pp. 3-26). Gabler Verlag.

"Orchestrator" (coordinates value creation networks)	**Integrated health care / disease management programme**	**Community** (creates and coordinates homogenous groups both demand and supply)
Insurance companies (risk sharing, may be private or public)	**Supplier of Specialised Services** (medical, technical...)	...
Supplier of Single Components (autonomous / neworked)	**Provider of Infrastructure** (platforms, bandwidth, interfaces...)	**Supplier of Commercial Services** (information broker, Quality&Security, Advice/Consulting...)

Figure 6: Business Models in the AAL sector based on Gersch & Hewing

For most AAL solutions, more than one model may apply or several models may be combined depending on the local or regional context. In the study conducted by Zoller, Bögle & Chiavi (2016), the authors – based on many interviews with experts and end-users – conclude that the models of Orchestrator, Supplier of Components as well as of Specialised Services are most appropriate and promising when it comes to AAL solutions for PwD and their caregivers.

They have, however, slightly adapted the models suggested by Gersch & Hewing (2012) to the special scenarios related to PwD and their caregivers and propose the following models:

3.3.1 Supplier of Single Components

Component vendors provide functional components (luminaire, scent and sound modules) and/or end-user devices such as sensors. They may be either intended for isolated use (autonomous, e.g. a stand-alone mobile luminaire) or networked with other components such as the scent and sound modules, with the possibility for vital parameter transmission if the sensor is included.

3.3.2 Single Contact & Access Point for Dementia

This model to some extent corresponds to the category *Supplier of Specialised Services*, but also includes aspects from the *Supplier of Commercial Services* category. However, the authors envisage a neutral and non-profit office/institution which provides information, advice and guidance to PwD and their caregivers incl. to the management and staff in nursing homes.

It consolidates decision-relevant information to create transparency in complex subject areas. For this purpose, data is collected, evaluated and structured

systematically and oriented towards special needs such as those of PwD and their caregivers.

3.3.3 Coordinator/Orchestrator

Orchestrators coordinate value creation networks by bringing together suppliers of components and services to create integrated solutions. New and innovative solutions are created by combining existing value-added modules from and, in some cases supplemented by new components, which can be combined with each other. The focus of the company's own business activities is on coordination along the value chain.

The services provided by the value network are invoiced in defined units/procedures (per transaction, per day, per month, etc.). The cooperation of the value network is regulated by internal contracts. This results in various basic forms, which are known in other industries, for example as general contractors, silent / open consortium or franchise system.

When it comes to selecting a business model, we also have to take into account the time aspect. For example, the single component supplier model can come into effect straight away, because it can be considered 'business as usual'. Whereas it will take time to implement the Orchestrator model. Besides, different models may well co-exist or they can be used in alternation depending on customer requirements and settings.

We propose to proceed in three stages for entering the market:

- Supplier of single components
- Single contact & access point (esp. for advice/guidance)
- Coordinator / Orchestrator

All three models can be applied to the two main settings in the three participating countries, namely:

- Fixed installation targeted at nursing homes and specialised care units (SCU)
- Mobile installation targeted at private households

As far as mobile installations for private customers are concerned, we consider leasing as the most attractive option given the dynamic progress of the disease.

3.4 Implementing the business models

On the following pages, we discuss in more detail how we are planning to implement the different exploitation approaches and business models in the participating countries.

Switzerland

In Switzerland, all three models stand a good chance of being put into practice. Thanks to the participation of Curaviva, the umbrella organisation of **nursing homes**, the **Single Contact & Access Point** could/will be implemented. Curaviva provides a unique access point to potential customers and already operates a so-called

"purchasing pool" which offers special discounts to its members. Companies who join the pool enjoy privileged access as well as help with marketing (e.g. mailings).

In addition to that, Curaviva is planning to set up a technology portal which resembles a virtual showroom. For products and services to be included in the portal, they must be easy-to–use, compatible with other devices, have a good cost-/benefit ratio and - in the case of personalised products -, guarantee the privacy of users. The products will be arranged according to practical application scenarios relevant for nursing homes such as fall prevention, fire protection or help with navigation/orientation. Such a marketplace would offer an excellent opportunity to the other consortium members such as emt ag to act as **Suppliers of single components** such as the GREAT luminaires.

In parallel, an interdisciplinary team will be set up to offer **advice, planning, design, installation, support and maintenance** for our systems. From preliminary discussions with SCU staff we know that many homes lack the resources (financial, technical, and human) to take on these activities and would be happy to hand them over to a trusted partner. Many studies confirm that confidence and trust are the most important criteria for and are rated more highly than functionality.[15]

At the same time, a study conducted on behalf of Curaviva[16] has shown that nursing home staff are quite willing to use AAL solutions provided they help them with routine and administrative work. However, when it comes to tasks in direct contact with customers such as support with eating or personal hygiene, they are sceptical. In any case, assistive technology should lighten the burden of nursing staff, not replace them.

The cooperation between Curaviva and the industry partners will result in effective user involvement, which in turn should ensure the acceptance of the proposed solution(s).

In the case of **private households**, the end-users will be reached by:

- Memory clinics and/or day-care centres that have been established to lighten the burden of care experienced by informal carers.
- Demonstration rooms / show rooms
- Living Labs – We shall integrate the GREAT solution into the living lab structures that are being established by the two research partners in Switzerland and the Lake Constance Region. This will include a simulated home environment, which allows researchers to use various prototype interfaces with test persons of different ages and health states.
- A variety of print and online channels (For more details, please consult the Intermediate Business Plan)

[15] See, for instance, the research results published related to The Future Care Lab at the Technical University of Aachen: http://www.comm.rwth-aachen.de/index.php?article_id=433&clang=0.

[16] „Pflege entlasten, nicht ersetzen" (2014). Downloadable from http://upload.sitesystem.ch/7589311EBD/5D242FAD61/2CED7020C4.pdf

Although the information and advice services may well be provided by organisations such as Curaviva, support and coordination services could be delivered by companies such as Belvita (www.belvita.ch) or Nestor (www.nestor-swiss-ch) both of which offer integrated solutions to private customers or neighbourhoods.

These companies could take on the **Orchestrator** function using different payment models such as charging by time unit, pay per use, or levy fees from advertisers and/or single component suppliers on their respective platforms.

Austria

There is no comparable umbrella organisation in Austria to provide a unique access point. However, thanks to a series of previous projects and initiatives, the GREAT coordinator FHV has forged close links with associations such as Connexia which offers information and training to people involved with dementia as well as with housing associations that cater for the special needs of the elderly.

Until now, FHV has been acting as a contact and access point for households who wish to or have installed AAL solutions in the region. Over time, the number of households has gone up to about 70 private homes. FHV also offers support and maintenance services.

Until now, all these services have been free to the end-users. However, it is clear that these tasks will have to be taken on by a professional service provided, especially since we expect numbers to rise. This may be a commercial company such as Belvita, an integrator of services such as Intefox or single component suppliers who want to extend their service portfolios and modify their business model accordingly. Moreover, Intefox is currently developing a partner company which can function as a direct service provider to the end-users for the complete cloud-service product (see http://www.sourceint.at).

Italy

Still under discussion

4 Marketing and distribution

Some of the basic questions around product distribution are who pays, how much and for what? And who are the distributors?

4.1 Introduction

In some countries, older people and family members are more reluctant to pay for types of AAL solutions than in other countries with people believing that these types of products and services should be provided by national/regional governments. In Switzerland, for example, experts note that people are willing to invest some private money on their personal health.[17]

[17] Rolf Kistler, Head of Ambient Assisted Living Research at the Lucerne University of Applied

This is corroborated by F. Vannieuwenborg from Flanders. In his communication from 25/11/2016 he writes that 'many AAL services affect the peace of mind of family, friends and relatives. Depending on the magnitude of investment, these actors have a certain willingness to pay for AAL solutions, e.g. GPS enabled watches for the confused elderly.[18]

He also advises against aiming for reimbursement since public health care systems are under great pressure everywhere in Europe. However, certain private care insurers are taking some steps and reimburse some AAL solutions to keep people at home longer, e.g. in the Netherlands. In Switzerland, Helsana, a major health insurer, offers premium reductions to people who invest in their own fitness. Similarly, the German insurance company AOK contributes a certain amount of money when their customers purchase fitness devices such as Fitbit wristbands.

To reach potential customers who are interested and willing to pay for services in the health&care sector at large, we will address them directly (B2C) on the one hand, and take the path of direct marketing in cooperation with relevant intermediaries such as end-user organisations (B2B2C), on the other hand. Even if Internet penetration of our primary target group may still be somewhat limited, we consider it essential to be present online and to use today's modern marketing instruments to achieve a much wider dissemination for GREAT also outside the immediate markets.

4.2 Payment models and distribution channels

Currently, the consortium is considering different **payment models.** Depending on the individual country, these include:

- Payment by customer/end-user directly (i.e. nursing home or private household)
- Leasing option for private customers
- Reimbursement of costs by insurance company or a public service provider or patient organisation

Since for the time, reimbursement by a third party is not a realistic option, we will investigate the **willingness to pay**, especially in the case of private customers.

In addition, we may experiment with novel marketing ideas, for example:

- 2% of the sales price of GREAT systems go to non-profit purposes e.g. research projects in the dementia area
- Go for a Social Impact Fund – i.e. looking for an ivestor who is willing to invest in long-term benefits for the society without having the typical ROI. According to Alain Thielmans and F. Vannieuwenborg from the Flemish CareClouds project some examples are already in place in the Netherlands.

Sciences and Arts, as cited in the Technopolis Report.

[18] F. Vannieuwenborg from the Flemish CareClouds in a private communication dated 25/11/2016.

The **product** will be sold as a solution by BARTENBACH and EMT on a packaged basis to the end-users. The software modules are provided as OEM licensing to them from INTEFOX (see Figure 5). The business partners will include GREAT in their portfolios which will open up new business opportunities.

The **key channels for the distribution** of the product are therefore

- End-User organization: by creating awareness of the solution and our system in hospitals and care facilities
- Demonstration facilities: providing the possibility for direct customers and end users to evaluate the product (e.g. exhibitions and fairs)
- Partners: already existing partners from BARTENBACH's and EMT's extensive network of sales partners, architects, light planners, facility managers, home automation experts
- Post-purchase support: will be provided directly by phone or in-platform support via the contact person or via app

4.3 Integrating app control into our installations

App control provides the ability to quickly install, configure and update DALIeco BT, DALI ACU BT, DALI PRO and LUXeye systems (individual systems vary in capabilities). Setup is faster and easier. Non-invasive maintenance is more efficient, meaning happier customers and less time spent on callouts.

Depending on the chosen solution, app control offers:

- Faster and simpler commissioning
- Easy configuration and pre-configured devices
- Customizable user interfaces
- Retrofit options for existing systems
- Easy-to-update firmware over-the-air
- Diagnostics and status reporting
- Password protection

With multiple intelligent control features that ensure the settings for the different modules is perfect for the current use of the room, app control gives users an easy way to control their comfort. It allows to manage preferences without needing to access a maintenance panel or central control, for example, easily set lighting scenes to activate at certain times and on certain days, depending on one's needs. One can configure the app's functions and override automated settings to suit one's preferences.

4.4 Conclusions and outlook

In our proposal we made the following predictions with regard to Market Impact:

Market impact (two years from the end of the project)	
sale of products resp. solutions	8-12 agreements signed with partners and licenses; 7-8 EU countries where the solution can be marketed; 280 solutions sold and 250 solutions leased in the EU
creation of new services	20% increase of request of new caring services; 10-15% share of revenue are derived from new services, new business model valid for 7-8 EU countries
presence on market	high commercial exploitation in the EU: 20% of the application market on which the solution has an influence; larger/broader R&D scope of the companies concerning AAL; higher reputation effects of the companies

In the opinion of our industry partners, these predictions are still realistic. However, given the fact that high-end installations in care facilities, in particular, have considerable support and service requirements, our activities will focus on the DACH countries, i.e. Germany, Austria and Switzerland, as well as the German-speaking part of Italy, at least in the first few years.

As far as the mobile installations for private households are concerned, we intend to extend our marketing activities to other countries using all the different channels discussed in 5.3 Distribution channels. Besides, by integrating app control, configuration, updates and maintenance can be done via smartphone or tablet from anywhere in the world.

As far as **long-term exploitation** is concerned, the current lack of employees with cross-functional qualifictions in areas such as chronobiology, lighting, electronics and computer science will have to be resolved. Knowledge gaps may defer market penetration of human centric lighting systems including the GREAT system.

Due to their complex nature, such systems require a solution-oriented selling approach rather than a straight-forward, product-based business model, at least when it comes to solutions for nursing homes or special-care units. This in turn raises the need for consulting and planning activities in the selling process. With our business models of "Single Contact&Access Point" and "Coordinator/Orchestrator" we intend to respond to these needs.

With regard to private households, the landlord-tenant dilemma may inhibit investments,, particularly in case of short-term real-estate investors with exit strategies. We address this dilemma by offering a leasing option to customers.

5 References

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