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Miraculous-Life

Miraculous-Life for Elderly Independent Living

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Miraculous-Life Consortium

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Abbreviations

<i>Abbrev.</i>	<i>Description</i>
AAL	Ambient Assisted Living
ADL	Activities of Daily Living
IADL	Instrumental Activities of Daily Living
CA	Consortium Agreement
CHI	Compulsory Health Services
GA	Grant Agreement
GDP	Gross Domestic Product
ICT	Information and Communication Technology
DoW	Description of Work
USP	Unique Selling Point

Executive Summary

As described for this task description (Task 7.2): A business strategy will define in detail the products to be exploited, and use this as input to develop a market analysis. The market analysis will incorporate all relevant market key figures and put together variables to obtain a clear picture of how commercialization should be achieved. The project will further develop shared strategies and individual business plans for the most promising products and services developed within this project.

As requested by the reviewers, this version of the document has been merged with another deliverable, the Business Strategy report (D7.4.2). The reason for merging is that there was a lot of (potential) overlap between these two deliverables, and there is a strong link between business cases and exploitation plan.

First of all this deliverable gives an overview of relevant market conditions. The main characteristics of this market are:

- Main development in the macro environment is the increasing number of elderly and the increasing life expectancy. The ageing society will result in an increasing demand for health-care services, while at the same time the number of health care workers will decrease. European governments are investing in development of tools to enable elderly to live independently as long as possible.
- When applying segmentation based on behavioural and psychographic characteristics, we estimate that in 2020 there will be approx. 10 million elderly living alone in Europe, with a physical or mental health problem. This is the target group for services and tools developed within Miraculous-Life.
- Conclusion of Porter's five forces model¹, is that the market seems attractive in terms of potential volume, but there are definitely competitive developments taking place. We see many examples of tools for monitoring significant events for emergency purposes, tools for tracking/navigation and detection of daily activity, and solutions for remote assistance. Some solutions are commercially available, others are under development.

In this final version of the Exploitation Plan / Business Strategy Report a marketing strategy has been laid out for the Virtual Support Partner (VSP) and Co-Net tool. The strategy is based on the main benefits offered by these tools:

- For the end user the main benefit is improved independence.
- For caregivers the Co-Net network can improve quality of care provision and reduce workload.
- Introduction of these technologies has the potential to reduce costs of care, which is a benefit for governments and insurance companies.

Main benefit for relatives and caregivers is to reduce their care load. Since several other tools and services are developed by project partners within this project, we also included a business case per tool or service. Initially the goal was to use pilot results to create an economic evaluation based on quantifiable success indicators. Because of changes in the pilots, we have used qualitative data justifying that tools developed within Miraculous-Life

¹ Michael E. Porter. "The Five Competitive Forces that Shape Strategy", Harvard Business Review, January 2008, p.86-104.

contribute to an exploitable service. This version of the Business Strategy contains business cases for technologies as developed by UCY, UniGe, Zoobe, Noldus, Fraunhofer and CiTARD.

The objective of the Miraculous-Life project was to attract both commercial and industrial interest in the project's technology and results at European and international level through an exploitation plan. We have identified a number of organization types that could be willing to invest in such developments. The exploitation plan has been described together with the partner exploitation plans. In this version of this deliverable, an updated ROI estimate has been given for the most important deliverable from this project, the VSP. This tool will be launched as a subscription service, although business models could eventually differ per country. Based on a subscription price of this service of €10 per participant per month, turnover would increase to almost €10 million in 2024 in the most optimistic scenario. In a more conservative scenario, the turnover is €3,6 million in 2024. Break-even point is between 2021 and 2025, depending on release date, required development time and adoption speed.

Although the long term care market differs a lot per country in Europe in terms of percentage of population receiving care, the percentage of informal unpaid care and the public expenditure on long term care, we can assume that the target group for the VSP has sufficient potential for introducing a viable service on the European market.

Regarding standardization, two approaches are followed. First, get an overview about existing standards in the care and the ICT domain so that the project can use available standards in the organization and for the technical development of various components of the system. Secondly, we monitored existing and ongoing work in standardization bodies and organisations. Moreover, the project worked and partners are working towards standards to ensure that the research and development activities, but also the organizational activities, related to standards are aligned with the existing and future trends. This all has the general objective to enlarge the business and exploitation possibilities for the system or system components.

1 About this Document

1.1 Role of the deliverable

The role of this deliverable is to focus on the main issues that need to be considered in Task 7.2:

- a. Drawing up business cases: Deliverable 7.3.2 has been merged with this deliverable, since there is a considerable overlap between the two deliverables. Based on the exploration of the market that is conducted in this Task, we will create business cases that may contain different exploitation strategies for the two pilot countries, as examples for exploitation in similar countries throughout the EU. In the original task description it was mentioned we will create two business cases. In this deliverable, we have extended this to a business case per developing partner.
- b. Setting up marketing strategies: Based on the results of the exploration of the markets in the two pilot countries and the business cases, we will define marketing strategies for the exploitation of the project outcome for each of these countries.
- c. Exploitation and Standardization Strategy and Plan: Main aim of the Exploitation and Standardization Strategy and Plan is to describe the initial exploitation strategy for the project outcomes and deployment plans as was stated in the DoW as well as the individual plans of the partners. It also offers an outline for the standardization related matters, by offering a place for listing the existing and used standards for the various topics in the project and the activities for standardization.
- d. Exploring European-level exploitation: The business cases for the three different countries that will be defined will be used as starting point for a basic plan for exploitation at European level. In order to do this, a high-level analysis of the similarities between markets in the EU countries will be performed, and it will be defined what possibilities there are to adapt the specific business to other EU countries.

1.2 Relationship to other Miraculous-Life deliverables

The deliverable is related to the following Miraculous-Life deliverables:

Table 1: Related Miraculous Life Deliverables

<i>Del</i>	<i>Relation</i>
D1.1	Specification of user needs analysis and design of VSP model : pointing out amongst other trends relevant for the marketing strategy and solutions for supporting independent living.
D6.1	D6.1 Trials Specification and Design : this deliverable lists a number of objectives and quantifiable success indicators that can be used for economic evaluation of Miraculous-Life
D6.5	Overall system evaluation and initial deployment : initial deployment report by consolidating the findings of the pilot operation of the services. The initial deployment report will allow for a near- and mid-term perspective of the Miraculous-Life outcome and give support for an outlook for the long-term and on a very-large-scale usability of the overall Miraculous-Life system. New evaluation approaches will be used during the pilots investigating whether an innovative ICT

	based daily home activity support system can result in reduced demand for use of care services and consequent care cost savings leveraging thus economic opportunities. The deployment plan will comprise the cornerstone for the commencement of the exploitation plan in WP7.
D7.1	Project website is relevant for creating awareness before actual product development has been completed.
D7.2	Dissemination strategy and plan: identification of target groups for dissemination activities, which might be also interested in the Miraculous-Life results in terms of commercial exploitation.
D7.5	IPR Directory provides a summary of the most widely used terms and concepts within Intellectual Property, and presents some of the basic rules governing access to and use of Intellectual Property. Further on, this document presents the elements relevant for the Miraculous-Life partners regarding the outcomes of the project.

1.3 Structure of this document

This version of the document describes the available market information and the individual business cases of the products and services being developed within this project. In addition, this document will give an outline of the marketing and exploitation strategy.

Chapter 2 will describes the main market conditions. Amongst others, and based on a Porter's five forces analysis, this chapter lists the main trends, estimated market size, segmentation, competitors and relevant external developments.

Chapter 3 contains the business cases of the products and services developed within Miraculous Life: what are the needs of the different user segments, in particular the target groups we want to focus on? What are the benefits we can offer to these groups, and how will we create additional value for them?

Chapter 4 focuses on the actual exploitation strategy, including ROI estimates.

Chapter 5 describes the standardization plans and offers an outline for describing them during the final stage of the project and in next version of this deliverable.

Appendix A gives an inventory of AAL solutions available in the market.

1.4 Differences with previous version

The main differences between this version (C) of the Exploitation and Standardization Strategy and Plan and the previous version (B) are:

- Section 2.2: updated and extended information about market and cost structure for care market in Cyprus, Switzerland, The Netherlands and Germany. Summary for rest of Europe added.
- Section 3.2: Benefits and USP's of the VSP updated based on experiences from the pilots.
- Section 3.4: business cases have been updated (CITARD, Noldus); new business cases have been added (UCY, Zoobe, UniGe, AIT)

- Section 3.5: business model MRPS and ORBIS have been added.
- Section 4.3: Added overall exploitation plan; updated exploitation plans partners.
- Section 4.3 / Appendix B: added scenarios exploitation plan
- Section 5 (standardization) has been updated and expanded.

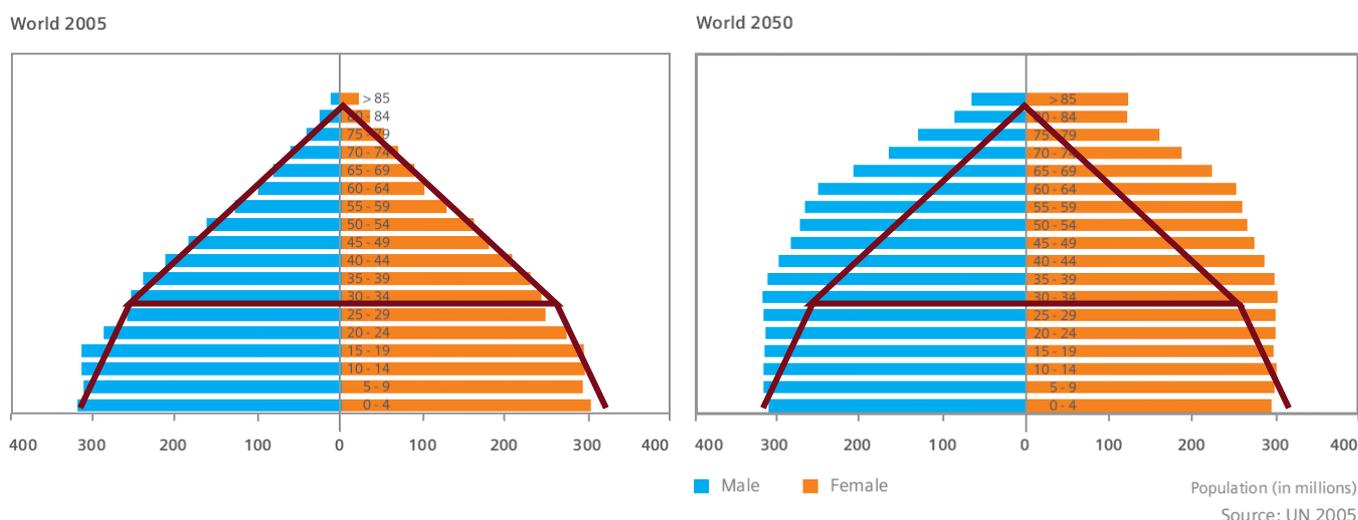
Apart from these major updates, there have been numerous minor changes.

2 Market conditions

There are two different types of relevant market conditions: the macro environment and the meso-environment. The latter mainly comprises the industry including competition, suppliers, and customers. The macro environment is often described using the DESTEP analysis, which stands for demographic, economic, political, environmental, socio-cultural and technological factors. The following paragraphs describe the most relevant trends for Miraculous-Life, as far as we know at this moment.

2.1 Trends in the macro environment

- Demographic changes pose significant society and economy challenges in all European countries. These include decreased quality of life for elderly and their surroundings (formal and informal professionals) and high economic costs. Especially in Western Europe, Japan and North America there is an increasing number of elderly people, with an increased life expectancy. The worldwide age pyramid illustrates this very well:



The ageing society will result in an increasing demand for health care services, while at the same time the number of health care workers will decrease. It is forecasted that in 2060 the number of people over 65 years will grow to 29,5% of the total population. Most adults prefer to remain in the home of their choice as long as possible².

- Technology: increased penetration in society of inexpensive portable devices, sensors and cameras, enables the development of assistive tools at affordable costs. According to the ITU, in the ICT facts and figures, household Internet penetration in Europe for 2013 was 77% and is increasing each year, not counting mobile internet access³.
- Political factors: dealing with demographic changes is one of the focus points in the Horizon2020 call and in the AAL Programme. These are just two examples showing that European governments do see the urgency, and are willing to invest in related

² Call for proposals AAL 2015, 16 April 2015.

³ The World in 2013 – ICT facts and figures (ITU, February 2013), <http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2013-e.pdf>

developments, for example by supporting development of tools that can help people to live independently at a higher age.

- Economic developments: within the EU, the economy seems to be recovering, with expected growth of GDP in 2016 of 2 %.
- Ethical issues: people are more aware of privacy and confidentiality of data. Being observed by a VSP and sharing data may not be acceptable to everyone. Especially for long term observations and when using multiple cameras (in an apartment for example), privacy is an issue. For short observations we expect this to be less of an issue. We assume there may also be people who are reluctant to accept this technology because they fear these tools may 'replace' human caregivers (even though we only want to support them). According to a recent research by Motivaction (NL), elderly people are enthusiastic about the use of home automation and technology if this means they are less dependent of other people. However, 77% of elderly people is afraid that this may lead to less social contact (<http://www.motivaction.nl/kennisplatform/in-de-media/65-plusser-omarmt-techniek-in-huis>).

2.2 Market size and structure

2.2.1 The Netherlands

In the Netherlands the amount of people being 65 or older will rise from 2.6 million in 2010 to 4 million in 2030. In this group the amount of people living alone will rise from 900.000 up to 1.4 million. From this group, according to the TFI ["Tilburg Frailty Indicator"]⁴ given in the European statistics database about 450.000 people will need care support. This group will rise to 700.000 in 2030. Extrapolating these numbers to the EU population suggests around 13 million people in need of care. This will rise up to 21 million in 2030. Outside Europe, for example in North America, Japan and China, comparable trends are visible, which means technology developed within Miraculous-Life eventually can also be exploited outside Europe. These figures show there is a huge potential.

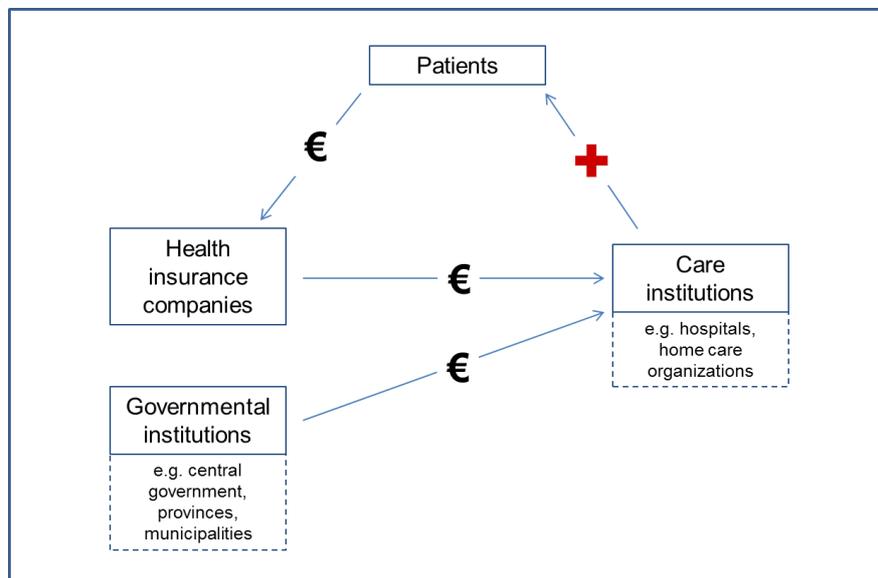
2.2.1.1 Funding of care

In the Netherlands, funding of care is organized somewhat differently from other European member states. Four big stakeholders play an important role in this funding principle: patients, care institutions, health insurance companies and governmental institutions. How these stakeholders relate to each other is schematically represented in the figure below. Basically, patients pay a premium every month to the health insurance company of their choice. These health insurance companies then purchase care from care institutions of all kinds who then provide care to the patients. However, in some cases, like for example home care and domestic help, care provided by care institutions is paid for by governmental institutions. What is paid for by whom, is captured in different acts.

Since the 1st of January of 2015, funding of home care and elderly care in the Netherlands became quite complex. Support and long-term care are organized completely different since then. The so-called "Algemene wet bijzondere ziektekosten" (AWBZ; National Act on

⁴ De Tilburg Frailty Indicator, Gobbens RJJ, van Assen MALM, Luijkx KG, Wijnen-Sponselee MTh, Schols JMGA. The Tilburg Frailty Indicator: psychometric properties. J Am Med Dir Assoc 2010; 11(5):344-355.

Exceptional Medical Expenses) expired and was merged into two other acts: “Zorgverzekeringswet” (Zvw; Health Insurance Act) and “Wet langdurige zorg” (Wlz; Long-term Care Act). The latter arranges all heavy, intensive care within the nearby area of the patient.



Schematic representation of the healthcare funding principle in the Netherlands

In the Health Insurance Act, personal care and district nursing services are arranged. Concretely, this means that health insurance companies carry the responsibility for nursing care at home up until hospitalization, since 2015. Health insurers should purchase care with good prices and quality themselves from home care providers. Patients then can choose the home care provider of their choice, as long as their health insurer purchased care with that particular provider. Besides home care, long-term mental care, extramural treatment, extramural palliative care and intensive childcare are organized within the Health Insurance Act as well.

Domestic help, day-care and support became the responsibility of the municipalities since 2015. This is organized in the “Wet maatschappelijke ondersteuning” (Wmo; Social Support Act). Municipalities should arrange a so-called “Wmo-desk” for their citizens. Information should be provided regarding possible options for these types of care. Choices for patients about care providers are limited and are partly made by the municipality. It is possible for citizens to gain a “persoonsgebonden budget” (PGB; personal care budget) which provides the possibility of a free choice about a provider.

Submission to and residency in care and nursing homes is paid for through the Long-term Care Act. With a so-called “Wlz-indication”, based on the current health status of the patient, patients have the opportunity to gain all needed care in care and nursing homes. This also includes for example meals and domestic help. Until the expiration of the National Act on Exceptional Medical Expenses, costs for residency in care and nursing homes was paid for by that act.

2.2.2 Switzerland

A detailed study of Home Care and its effects on hospitalizations was conducted by Judite Goncalves & France Weaver at the University of Geneva in 2014. In this section we present

study results. More details can be found in the document available on the internet <http://www.unige.ch/ses/dsec/repec/files/14095.pdf>.

Two main characteristics of health policy in Switzerland are relevant for this study. First, health policy is decentralized in the 26 cantons. Broadly speaking, the federal government defines the general principles of health policy and the cantons and municipalities (the smallest administrative units) regulate and finance health care. For example, the numbers of hospital and nursing home beds, doctor offices, and home care providers are regulated at the canton level. Second, since 1996, health insurance is compulsory. Every person living in Switzerland is covered in case of illness. Covered services include hospital-based inpatient and outpatient care, doctor visits, and medical care provided in nursing homes or at home.

The decentralization of health policy drives variation in home care use across cantons. Cantons influence home care use through the regulation of supply and subsidies to home care providers and users. Therefore, canton-level home care use can be viewed as a measure of generosity of canton home care policy and is relevant for funding decisions and policy making. For example, in 2012, the canton of Schwyz provided 0.9 hours of home care per capita, and Jura 3.2 hours. Cantons also differ in their growth rates of home care use over time. From 1997 to 2012, home care hours per capita decreased by 20 percent in Geneva and increased by 398 percent in Ticino. Nationwide, home care expenditures have grown by 92%. In 2012, home care amounted to 2.3% of total health expenditures, or 0.3% of the Swiss GDP. Although these proportions are small, home care is provided to vulnerable populations, such as the elderly and the disabled. The 65+ represent more than 70% of home care users in Switzerland.

Independently of age, any person who is sick, disabled, or has limitations due to age or maternity is eligible for home care. The local home care provider assesses the level of care required by each patient. The two main types of home care are medically- and non-medically-related care. The former mainly consists in nurse visits, and the latter includes help with ADLs and IADLs.

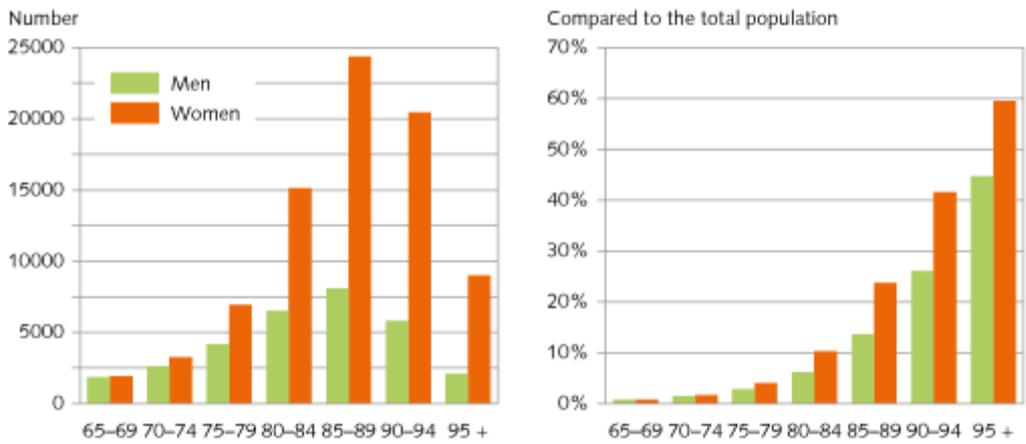
The financing of home care is complex and depends on the type of care. If prescribed by a doctor, home care services are covered by compulsory health insurance (CHI). This is the case for medically-related home care, which may include some help with limitations in ADLs. Non-medically-related services are usually not covered by CHI, although they may be covered by accident insurance, for example. In general, these services are paid by the patients and subsidized for low-income individuals. Besides CHI, there are various public sources of financing. First, the cantons and municipalities directly subsidize home care providers. Second, the federal government provides direct subsidies to patients: the 'allowance for impairment', for persons with disabilities, and 'supplemental benefits' for low-income retired or disabled persons. Some cantons provide additional supplemental benefits. Lastly, there are indirect subsidies to patients, as the price of non-covered services (e.g. help with IADLs) may depend on the patient's income, wealth, and direct subsidies received. In 2008, 47% of total home care costs were covered by direct subsidies to providers, 36% by CHI, 7% by direct subsidies to patients, and 6% paid out-of-pocket. The remaining 4% were covered by accident and military insurances.

2.2.2.1 Key figures for Home Care in Switzerland

The following figures were provided by the Swiss Federal Statistics office.

1. Older people in nursing homes

People living in a nursing home, in 2012



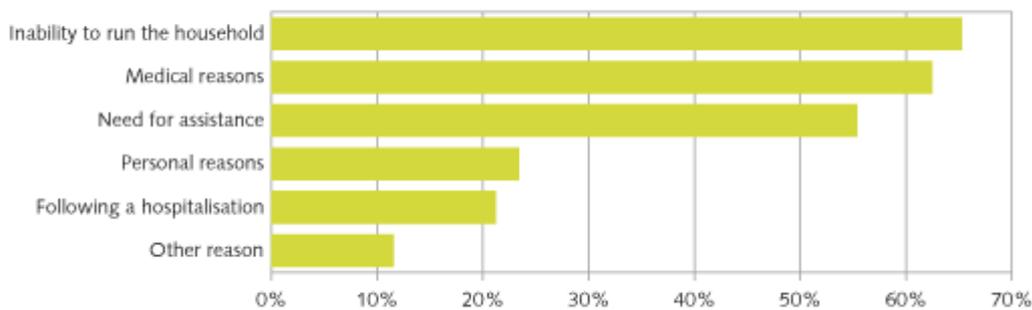
Sources: FSO – SOMED, Population and Households Statistics

© FSO, Neuchâtel 2014

In 2012, the number of people aged 65 or over was 1.398 million, i.e. 17,4% of the population. At the end of the year, 86.000 (6%) of them were residing in a nursing home for a long-term stay. The total number of persons who completed at least one long-term stay in a nursing home during the course of the year was 112.155.

Reason for admission to a nursing home, in 2008/2009

Multiple answers possible



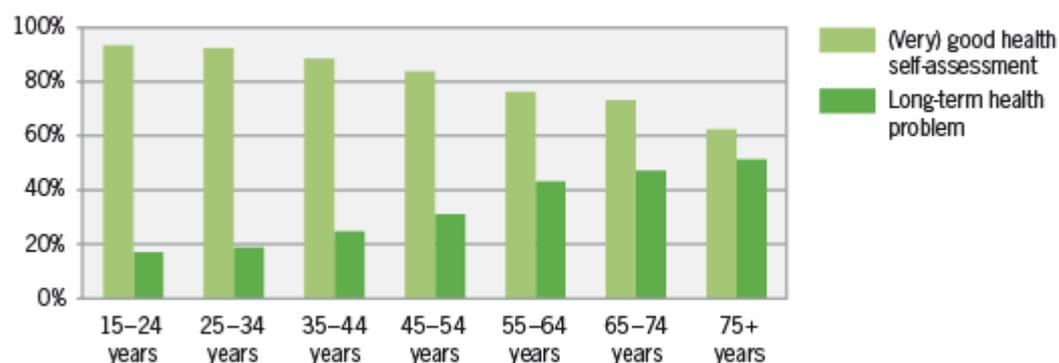
Source: Survey on the State of Health of Older People in Institutions

© FSO

People take up residence in a nursing home as a result of a combination of problems: More than 70% of older people cite several reasons for moving to a nursing home. Medical reasons are almost always accompanied by a need for assistance or inability to perform household tasks.

2. General state of health

Self rated health and long-term health problems, 2012



Source: SHS

© Federal Statistical Office (FSO)

83% of the population (84% of men and 81% of women) perceived their general state of health as good or very good. The self-assessment of health is considered to be a valid indicator of general health, both at individual and population level. The percentage of people who consider their health to be (very) good steadily drops with age. This proportion is also lower among people whose level of education does not exceed compulsory schooling than among people with tertiary level education (62% compared to 90%).

One third of the population state that they suffered from long-term health problems (30% of men and 34% of women). The proportion of people who assessed themselves as having a chronic health problem increases with age and is highest among those with obligatory schooling (39% compared to 30% of people with tertiary level education).

Table 2: Health care costs for 2014 in Switzerland

Indicators of health care costs		
Costs of health care system as percentage of GDP	11,1%	
Health care expenditure per capita and month in CHF	724	
Health care costs in CHF million	71.167	
Health care costs by service provider	in CHF million	as % of total
Hospitals	25.873	36,4%
Out-patient providers ⁵	12.313	17,3%
Nursing and residential care facilities	22.880	32,1%

⁵ Judite Goncalves, and France Weaver, "Home care, hospitalizations, and doctor visits ", working paper series WPS 14-09-5, Geneva School of Economics and Management, University of Geneva, Geneva, Switzerland, <http://www.unige.ch/ses/dsec/repec/files/14095.pdf>

Costs of health care system by service type		
In-patient treatment	31.880	44,8%
Out-patient treatment ⁶	24.860	34,9%
Sale of health-related goods	7.321	10,3%
Costs of health care system by financing schemes		
Social insurances	30.527	42,9%
Other social protection, means-tested schemes	3.167	4,4%
Private households	17.263	24,3%
State	14.302	20,1%

2.2.3 Germany

In Germany the number of persons requiring care was at 2.63 million, approximately 70% of them receiving care at home⁷. Previous expectations have been exceeded. The number will grow to about 3 million by 2020. The market is distinguished strictly into 'stationäre Pflege' (stationary care) and 'ambulante Pflege' (ambulatory care). The first encompasses institutionalized care, either full-time, part-time (e.g. day/night) or short term, if the informal care person is absent. The second one includes any care services provided to persons still living at home.

The stationary care market is currently undergoing several changes⁸. The market in 2009 had a volume of approximately €20 billion. The trend foresees a need for 4.300 new or rebuilt care facilities until 2020 and a demand for up to 108.000 care workers in this sector alone. Another trend is a consolidation in the market. As there are numerous smaller participants the rate of insolvency has increased in the past years. The majority of new projects is therefore executed by larger investors. The majority of care institutions is held by non-profit organizations (55% in 2009, notably churches), with a growing number of private investors (40% in 2009). The number of private investors is expected to grow.

⁶ Swiss Statistics, Health, <http://www.bfs.admin.ch/bfs/portal/en/index/themen/14.html>

⁷ Pflegestatistik 2013 - Statistisches Bundesamt -

https://www.destatis.de/DE/Publikationen/Thematisch/Gesundheit/Pflege/PflegeDeutschlandergebnisse5224001139004.pdf?__blob=publicationFile

⁸ Ernst & Young Stationärer Pflegemarkt im Wandel – 2011 - http://www.paritaet-lsa.de/cms/files/pflegemarktstudie_2011_ernst_young.pdf

The ambulatory care market was providing services to 1,25 million people in 2014. The number of employees has exceeded 300.000 in 2014⁹. The number of companies providing services is at 13.750, with the overwhelming majority having 20 or fewer employees. However, there is a trend towards larger companies, with their number growing in absolute terms by 1,79% for 20-100 employees and 0,32% for 100+ employees. This trend is positive for the developments being done within Miraculous-Life. With the number of persons requiring care increasing, the number of employees is expected to grow considerably until 2020.

Another driver of the German care market is the lack of qualified personnel in the care sector¹⁰. There are different predictions expecting a lack between 140.000 and 200.000 qualified carers until 2020. There are several countermeasures, including increased immigration, improving salaries and quality of work and facilitating care technologies, including tools developed within this project.

The market for care technologies in Germany is difficult to estimate up to this day. The economic potential in Germany has been estimated up € 87 billion in 2012¹¹. However, the often high price of those systems and the unclear reimbursement possibilities have led to a small manifestation of this potential so far, with a willingness to pay that reaches around € 5 billion in 2012. The challenges of the future will include the creation of a political and social landscape that balances between the demand for technologies and employees, the rising cost, and the distribution of cost between the public and the affected families.

2.2.4 Cyprus

Older adults, at the age of 65+ hold 13,9% of the population in Cyprus and 7,4% are living alone in their households as of 2014 statistics. The healthcare system in Cyprus consists of two delivery mechanisms: the public sector and the private sector. The centralized structure of the public sector is financed by the state budget and is responsible for the planning, organization, administration and regulation of the healthcare services. Healthcare is provided by the primary healthcare centres and the hospitals under the direct control of the Ministry of Health, in the form of primary health care, specialists' services, paramedical services, emergency services, hospital care, pharmaceutical services, dental care, rehabilitation and home care.

There are two types of private sector programs in Cyprus: Home Care Nursing provides a) short term care: includes individuals, which according to evaluation by home care nurses, will benefit from a two month nursing care service and b) long-term care: includes individuals that after being evaluated by a home care nurse are provided with nursing home care services that lasts more than two months¹².

⁹ Marktstruktur und Mitarbeiterentwicklung im ambulanten Pflegemarkt – 2014 - <http://www.pflegemarkt.com/media/datenmarkt/uploads/fachartikel/mitarbeiterentwicklung-bei-ambulanten-pflegediensten.pdf>

¹⁰ <http://www.bmg.bund.de/themen/pflege/pflegekraefte/pflegefachkraeftemangel.html>

¹¹ Ökonomische Potenziale altersgerechter Assistenzsysteme – BMBF 2012

¹² Kouta, C. et al. (2015) Evaluation of Home Care Nursing for Elderly People in Cyprus, *International Journal of Caring Sciences*, Vol. 8, No. 2, pp. 376-384.

Home care (not nursing care) is provided also by the Social Welfare Services in Cyprus aiming to support vulnerable groups of people such as the elderly, to enable them to live at home. Carers visit people at their own homes in order to provide personal hygiene, house-cleaning, washing of clothes, shopping etc., but compared to the community nursing staff are not educated or experts on the health/nursing care.

Cyprus has joined other Southern Mediterranean countries in moving long-term care towards the 'migrant-in-the-family' model. Home care is largely provided either by informal, unpaid carers within the family or paid, live-in female migrant workers mostly from Asian countries. In Cyprus, like elsewhere in the Mediterranean, migrant care workers are more affordable than local workers, and they are plentiful. Standard contracts set by the government contribute to keeping the wages of these workers very low¹³.

According to EU statistics, personnel shortages in elderly care – especially of semi-skilled care workers and professionals – are reported or forecasted in a large number of countries, including Cyprus¹⁴. Considering that the total health expenditure has increased over time from 510 million euro in 1998 to 974 million euro in 2007 with individuals at the age of 75 and above affecting this expenditure heavily¹⁵ urges for actions to be taken towards supporting the elderly care sector in the island.

The financing sources of the social protection system in Cyprus vary between the different parts of the system¹⁶. At the moment, government provision of health care services is funded out of general taxation, with the exception of a small part financed from charges imposed on some services.

Entitlement to publicly provided free medical care is based on individual earnings below €15.300 per annum, household earnings below €30.600 per annum (increased by €1700 for each dependent child) and households with more than three children. Individuals with incomes between €15.300 and €20.400 and households with incomes between €30.600 and €34.400 (increased by €1700 for each dependent child) receive health care at reduced cost. On the basis of these criteria approximately 85–90% of the population has access to free or reduced rate public health services, the remainder pay according (reduce cost) fee schedules set by the Ministry of Health.

While the public sector provides free, or reduced cost, medical care to poor people and its own employees, high-income groups that are not civil servants are excluded from the system. Moreover, individuals who access the public health care system do not have as much choice as those in the private sector.

¹³ Ellina, C. (2010) Elderly care in Cyprus. Provisions and providers. External report commissioned by and presented to the European Commission Directorate-General for Employment, Social Affairs and Equal Opportunities, Unit G1 'Equality between women and men'.

¹⁴ EGGE – European Network of Experts on Employment and Gender Equality issues – VC/2009/1015

¹⁵ Andreoua, M., Pashardesb, P., & Pashourtidoua, N. (2010). Cost and value of health care in Cyprus. Cyprus Economic Policy Review, Vol. 4, No. 1, pp. 3-24.

¹⁶ Health Systems in Transition: Cyprus Health system review, Vol. 14 No. 6 2012, http://www.euro.who.int/_data/assets/pdf_file/0017/174041/Health-Systems-in-Transition_Cyprus_Health-system-review.pdf

2.2.5 Rest of Europe

In the paragraphs above we have focussed on four countries: Switzerland and The Netherlands because the end user organizations are located here, Germany because this is the largest market in Europe, and Cyprus because this is the basis of one of the SME's that may pursue development of tools resulting from this project.

The long term care market differs per country within Europe, and as described above it can even differ within countries. Figures illustrating these differences¹⁷:

- Long-term care public expenditure (health and social components) vary between 0% (Greece) and 3,7% (the Netherlands) (figures 2011). In some countries, like Portugal, Germany and Spain, private household out-of-pocket expenses are a substantial source of funding, while in other countries (for example Belgium and France) this part is negligible. Expenditures are expected to increase more than 90% between 2010 and 2060.
- Also the scale of need for long-term care differs: in the population aged 75 years and over the percentage of people experiencing limitations (strongly or to some extent) varies between 32,6% in Sweden and 88,9% in the Slovak Republic. These figures should however be treated with caution as people's assessment is subjective and can be affected by cultural factors.
- Percentage of the population aged 65 years and over receiving long-term care varies between 0,8% in Poland and 19,1% in The Netherlands.
- Because of affordability, governments prefer to rely on informal, unpaid careers. Also the elderly themselves prefer a relative to take care. The percentage of the population providing informal unpaid care differs: in Belgium 20,6% of the population aged 50+ provides informal care, in Sweden this is 12,3%.

2.2.6 Summary

The figures currently available show different estimates, but it seems fair to assume that the number of elderly living alone in need of support in 2020 in Europe will be around 17 million. Previous research indicates that 60% of this group is willing to use devices if this helps to improve their quality of life. This suggests there are approx. 10 million potential users in Europe. This is approx. 10% of all people aged 65+ in Europe. This figure can be used for further ROI calculations. The actual number may be smaller if people have to pay for the service themselves, since not everyone will be able or willing to spend the required resources. However, if an insurance company or local government covers the costs, this will not become an obstacle. Since study results so far indicate that couples are less likely to accept this type of assistive technology, it is fair to focus on singles.

¹⁷ Adequate social protection for long-term care needs in an ageing society. Report jointly prepared by the Social Protection Committee and the European Commission services. 2014

The market structure differs per country within Europe, and even within countries. This makes it unfeasible to develop one single strategy that will work well for all regions.

2.3 Segmentation

There are different segmentation strategies, depending on how we approach the market. The basis for our strategy will be the profile of the target customers, which for the VSP could be:

- The actual users of the system: elderly people living alone with light physical or mental health problems and thus in need of support. This group can further be segmented in a number of ways:
 1. Segmentation by demography, for example income, age group or gender.
 2. Geographically, for example living in the countryside or in a city, or by country.
 3. Segmentation based on behavioural characteristics, for example health state, mobility, vision or hearing capacity, need and usage of care and assistance.
 4. Based on psychographic characteristics, for example attitude towards technology and innovation or IT knowledge.
- The party who is the actual 'buyer'. This could be the elderly themselves, or a relative. It is also very well possible that insurance companies, local governments or formal care providers pay for the service. This will probably vary per country, given the different way that elderly care is organized per country.

The main commonly used criteria to achieve a relevant segmentation are (an extensive overview of criteria can be found here¹⁸):

- a. Size of the segment should be large enough.
- b. We have to be able to identify and reach customers within this segment.
- c. Customers in this segment should be able and willing to pay for the service.
- d. Characteristics of the segment should be relatively stable over a longer period.

For solutions and services developed by the different partners within Miraculous-Life, it will be necessary to differentiate segmentation and actual target groups, as this may very well differ per solution. For example, for the EmotionFusion Tool as developed by Noldus, it may turn out that this will be introduced on OEM basis as part of a solution offered by a third party. For an organization like Noldus, that does not yet have a track record providing AAL solutions directly to end users, it is hard to identify and efficiently reach customers mentioned above, so we do not meet the second criterion. However, it is possible to make an estimate of the size of the market segment in terms of end users:

As mentioned above, we estimate that in 2020 there will be 17 million elderly people in Europe who are living alone, but are in need of support. Relevant segmentation characteristics that could be useful to further define the actual target group could be:

¹⁸<http://www.yourarticlelibrary.com/marketing/11-criteria-for-effective-market-segmentation-marketing-management/22180/>

1. Based on behavioural characteristics: type of physical or mental health problem. The solution we develop, may not be useful for example for people who have limited vision capacity, or are suffering from dementia. At this moment we assume all elderly with a health problem will be able to benefit from this solution.
2. Psychographic characteristics: attitude towards innovation. The elderly, who will use the tools developed within Miraculous-Life, should at least acknowledge that such technology can improve their quality of life. As already mentioned above, previous research indicates that 60% of the elderly population belongs to this group. One may expect this percentage will grow in the future, but this means that there would be approx. 10 million elderly willing to accept and use such technology.

The size of this segment is therefore large enough and will grow. However, the third criterion - are people able and willing to pay for this service? - is harder to meet of people have to pay for the service themselves. Whether they are able to pay therefore depends on the funding: do they have to pay for themselves, or is for example an insurance company or care provider taking care of the costs. If they have to pay for it by themselves, one can expect that for lower income groups access to this technology is more difficult, which will decrease the size of the target group.

2.4 Porter's five forces model

Porter's five forces model¹⁹ is a tool that helps to describe market trends: how active are competitors, is there a threat of new competitors entering or substitute products being introduced, what is happening with customers and suppliers, etc. Based on this situation description, we can conclude whether the market is becoming more or less attractive.

2.4.1 Competition

As Table 1 in D1.1a - Specification of user needs analysis and design of VSP model ²⁰ shows, there is a large number of projects in the area of ICT for ageing well. Some have been completed, while others are still in progress. The table lists almost 30 projects, but more might exist. An additional market scan has resulted in an overview of tools available commercially or being developed. These can be categorized as follows:

- Tools for monitoring significant events for emergency purposes, e.g. fall detection. These can be based on infrared technology, body-worn sensors or video technology, or a combination.
- Tools for indoor tracking/navigation and detection of daily activity for non-emergency purposes. Mostly based on the same technology as the first category. Examples of commercially available solutions are TeleAlarm (who are now testing tools for pattern detection that can detect changing patterns of elderly) and Sensara, a sensor based system for monitoring daily activities.

¹⁹ Porter five forces analysis: Porter, M.E. (1979) How Competitive Forces Shape Strategy, Harvard Business Review, March/April 1979

²⁰ Miraculous-Life D1.1a: Specification of user needs analysis and design of VSP model

- Solutions for interacting and supporting people with need for assistance remotely. There are many examples of such tools, the ones which are commercially available or close to commercialization are:
 - Victoryahome is using a Giraff (costs €6-7k). Functions: alarm (and follow up), virtual visits and visit requests, medicine reminders, movement check, fall detection, panic button. Advantage compared to Skype (for example): the robot moves through the house, like a real visitor he can come to you, plus no knowledge required.
 - Sonamba offers ADL monitoring (by monitoring movement and sounds), medicine reminders, panic button, socials communication.
 - Quli: platform connecting apps, care providers, relatives, friends with elderly. Mainly for help with daily activities, and medical information, including video calling.
 - Virtask: virtual assistant (avatar) for agenda control (reminders of meetings and medicine), control of home automation, video calling with caregivers or relatives, personalized news.
 - PAUL: an extendable platform based on an AIO-PC residing in the user's home that can be extended with several sensor systems and specifically developed services.
 - Abilia MEMOmessenger: reminder services, orientation and navigation using specifically designed hardware.
- Robots that can actually perform caring and nursing tasks, such as RIBA (Robot for Interactive Body Assistance) by RIKEN, Care-O-bot, Rose.
- Robots as companion tool, for example Vughterstede is testing an Aldebaran robot programmed for care, rehabilitation and animation (Zora). Within projects the FP7 Marie Curie IAPP, and the H2020 project GrowMeUp, also a Social Robot is being developed.

The first three categories are at least partial competitive, the robot solutions can be regarded as substitutes. Especially in Japan, with its ageing society, we see a lot of developments in this area. Given the large number of projects, we can expect the entry of products and services which are at least partly offering functionality comparable to the VSP, which will mean that the competitive rivalry, which at this moment is still low, is expected to become stronger. The fact that we do not see successful competitors yet is also related to the fact they have to deal with the same entry barriers as we do, such as unclear business models or legal issues.

2.4.2 Customers

The end users of the VSP are elderly (65+) living alone and independently, with light physical or cognitive problems. There may be a reluctance using new technology (as also stated in section 4.6 of the specification of user needs (D1.1a)), but in future this will become less because current younger generations are more accustomed to using technology in their daily life.

The initial geographic target market of this product is Europe, where the number of potential users of the system will grow considerably in the next decades. Their bargaining power in

the sales process is not particularly high though, but this is different when the actual buyer is an organization like an insurance company, patient association or care provider. These organisations become bigger and more powerful, which could mean their bargaining power increases. However, because of the increasing number of elderly, they will have to look for alternatives for their current service offerings. This may very well eliminate the increasing bargaining power. At the same time the way that care is being financed differs per country, which may lead to different business models.

For the EmotionFusion tool that is being developed by Noldus, we can also look at OEM partners for commercialization. This actually means that parties labelled as substitute solutions or (partial) competitors, could be potential OEM partners. For example Giraff, Aldebaran, Rose, Virtask or Quli could be interested in adding emotion analysis to their solution.

2.4.3 Suppliers

Suppliers provide hardware, software and services which enable us to create the VSP. Since the most crucial developments will be done by project partners, and products purchased externally will probably be provided by more than one supplier, we do not expect that the bargaining power of suppliers will be very high, or increase in the near future.

2.4.4 Substitutes

There are a lot of existing tools that can be regarded as substitute for the VSP, varying from products that remind people to take their medicine to Skype. Also the human caregiver such as a nurse or neighbour can be regarded as a substitute, so can the robot based solutions mentioned in section 2.4.1. At this moment we do not see other substitutes that can be threat for development of the VSP, but the number of available solutions can certainly become an increasing threat for this project.

2.4.5 New entrants

As already stated in the paragraph about competition, it is likely that spin offs from collaboration projects will result in competitive products, which means there is a serious risk that new players will enter the market.

2.4.6 Conclusion

There are many different trends in the market, both positive and negative, and there is a lot of diversity within Europe. In general the market seems fairly attractive in terms of potential volume, but it is to be expected that competitive developments are taking place. Therefore it is essential to launch a final product on a short term, the parties who are first in the market will have a head start.

When looking at different components developed within Miraculous-Life, the situation can differ per tool and service. For example, the EmotionFusion tool as developed by Noldus can be attractive for OEM partners, because this can offer them a competitive advantage. When the market for solutions supporting elderly in their daily activities grows, this becomes a more attractive market.

3 Business Cases

3.1 Introduction

The consortium will mainly follow four key routes for the exploitation of the project outcome:

- Its use in commercial activities by selling it in the market, integrated into products or services.
- Its use in further research activities, such as research aimed at improving it or embedding it in other products/services.
- Use of the results for direct use in their activities. This is the case of the end user organizations (ORBIS, MRPS) involved in the project. Pending the successful operation of the Miraculous-Life pilot trials, ORBIS and MRPS will expand the current range of services already provided to elderly people to distribute the services of the system at regional or district level.
- Improvement of knowledge on the AAL subject for further research. This strategy will be adopted by the partners who look to capitalize on the knowledge acquired during the project activities by developing further research on the subject of AAL.

To address these objectives, special attention has been given on the development of a solid business strategy, estimating the costs for market deployment (for products and/or services) and describing the overall business model for how to develop business from the results of this project. At this moment we foresee that in particular independent parts of the developed software are of interest for commercialisation in different markets. For example the Avatar interface consisting of the emotional and dialogue components, Co-Net component, Safety Tool. These parts can be either commercialized by the partners that developed them or taken under license from the industrial partners (Noldus, Zoobe, and CiTARD) to be included in other products.

The SMEs of the project could also develop value added services that will be proposed to elderly and home care organizations that use the Miraculous-Life products, in the form of independent applications (via for example an internet store of the type of the Apple Store).

The consortium expects to achieve the initial economic targets by using the pilot demonstrations as portfolio to reach possible clients for the following areas: Elderly people (final costumers), formal and informal carers (family, friends, neighbours, care organizations), private and public elderly care organizations (including ORBIS and MRPS), private or public organizations that contribute to financing or enabling AAL products and services (public sector service organizers, social security systems, insurance companies), industry players in the market (e.g. telecommunications operators, developers of robots or support and monitoring systems) or developers who want to use the existing platform as a basis and expand it with new services for different target groups.

Since there are significant differences between the different European countries and regions, it will be necessary to optimize the plans and strategy per area. Within this deliverable we will define a strategy that can be used as a starting point, but needs to be fine-tuned per area during the commercialization phase.

3.2 Benefits and USP's of the VSP

Benefits offered differ per party in the chain between supplier and end user. This paragraph lists the main benefits of the total solution, the VSP.

For the VSP as originally proposed to develop within the scope of this project, it was initially planned to quantify these benefits by looking at the economic value which they generate. A number of the objectives as specified within the original planning for deliverable 6.1 (Trials Specification and Design) can offer direct or indirect financial benefits if they are met. Whether the objectives are met or not, will be based on a series of success indicators. The following success indicators can be used for the economic evaluation:

- Average time spent by the elderly to make use of different services to be significantly decreased (targeting 60%) from the beginning till the end of the project. If the elder make less use of services, this will reduce resources required for offering these services, in particular from formal caregivers.
- Number of support alerts needed by the elderly in carrying out their daily activities to be significantly reduced (targeting 60%), from the beginning till the end of the project. Same as above, this will reduce workload from caregivers.
- Good improvement (targeting 45% reduction) on the care consumption (including actual elder's support visits of informal and informal carers at home), from the beginning till the end of the project.

These measures would have enabled us to assess the economic value of the services and products developed within Miraculous-Life (social and psychological effects are more difficult to quantify directly in terms of economic benefits). If these objectives would have been met, this could have created evidence that USP's mentioned in this report are actually justified. This mainly concerns time and thus cost saving at the side of formal caregivers, which can also be a financial benefit for insurance companies or governments, depending on how the care is organized and financed in a region.

During the course of the project, it was however necessary to change the planning and the set-up of the trials. As a result it is at this stage not possible to deliver quantifiable success indicators. However, the experiences so far have made it possible to collect qualitative data that are a valuable contribution to an exploitable end result. In the following sub-chapters, the most important benefits mentioned by primary and secondary end-users during the trials will be mentioned, knowing that a more detailed analysis can be found in deliverable 6.5 – final results of the trial.

3.2.1 End user

For the end user, the elderly, the main anticipated benefit was possible independence thanks to the support offered by the VSP and an increased sense of safety.

A second benefit that was regarded to be very likely was that thanks to this feeling of independence elderly would be more autonomous which might influence their quality of life. This combined with motivation, and positive interest, could also help in preventing early degradation of skills and capabilities.

The speech input/output solution designed in the Miraculous-Life system was hailed by both MRPS seniors and caregivers. In fact, speech input and output technologies could “compensate for sensory impairments” (MRPS caregiver) – i.e. impaired vision.

Independence and autonomy were indeed mentioned as a benefit in the focus groups by the caregivers in ORBIS and MRPS. Improvement we could not measure, but they all thought it would possibly influence independency. At MRPS also part of the participants mentioned that technologies targeting seniors, in general, could promote their autonomy and independency. Some of the MRPS participants strongly think that tablet-based solutions will be offered by default in Swiss healthcare organizations in future and will improve communication between the seniors and the caregivers.

Another benefit mentioned in the interviews with elderly at ORBIS and focus groups of caregivers were preventing loneliness due to the companionship of the VSP. At MRPS, a couple of seniors also mentioned that a system able to recognize loneliness and negative emotions might prevent social isolation. Nevertheless, most part of the MRPS participants (seniors and caregivers) highlighted that “the machine should not replace the human”: the VSP should act as the interface between the senior and his/her social environment, by promoting social activities when the user is sad for example. For those participants, the Miraculous-Life system should not provide directly emotional support via the VSP: the machine should not enter in an “emotional game” with the user – e.g. “if the user invests emotionally on the machine, this could result in an increased risk of being socially isolated or lonely” (MRPS caregiver). Also the elderly felt safer, which was confirmed by caregivers at ORBIS and MRPS.

Finally the solutions developed within this project were expected to stimulate elderly to keep or even influence social interactions, and that some services would stimulate activity which will keep the elderly active, which could improve their feeling of well-being. The findings of the trials confirmed that there was an increase of social interaction by talking to the avatar and because of the agenda/activity/Skype functions. More specifically, through the Co-Net, the elderly could improve his socialization with like-minded elderly, as well as their family, friends, and other informal carers. This would alleviate the sense of social isolation (loneliness) and improve social participation that is proved to be a very important aspect for adults in the aging path.

During the focus group sessions, several MRPS members of the animation department also mentioned, that a “funny avatar” could stimulate and motivate the residents in participating in social activities provided that all the residents have the system at home. By reminding the appointments and activities, the VSP should reduce the risk of forgetting activities, keeping thus the senior active.

The results of the trials so far indicated the following:

- The VSP could possibly promote independence due to the services offered by the VSP.
- The VSP could reduce loneliness.
- Due to the feeling of independence elderly would be more autonomous which might influence quality of life positively.

It is likely to expect that the experienced sense of well-being will have a positive effect on the health situation of the elderly, and will help to reduce care consumption in the future because of prolonged autonomy.

The features that were most appreciated by the users were the physical activity service with physiotherapy movies, call for help, fall detection, appointment and medication reminders

and meal accompaniment. During the survey amongst elderly they also indicated that these were the functions they were expecting to use mostly. The sense of safety (fall detection, call for help, medicine reminder, warning when the furnace is left on...) turned out to be much appreciated.

3.2.2 Formal and informal caregivers

For formal (care providers) and informal caregivers, the continuous collaboration and communication offered by the Co-Net network will possibly provide increased continuity and efficiency (time saving and thus cost saving). This could improve quality of care provision and reduce workload, stress, and demand for resources. Interestingly, during focus group sessions MRSP care coordinators mentioned that such a system could reduce workload, and thus stress. According to the members of the MRPS “Service to the Residents” and animator members, the system could improve and simplify the communication between seniors and caregivers and the organization of group activities provided that: (1) caregivers can check whatever the seniors received and read a message sent, (2) all the seniors are equipped in their apartment. Nevertheless, MRPS nurses suggested that a system like Miraculous-Life “could increase the work charge, especially at the first stages of the implementation”. Also at ORBIS caregivers mentioned that in the beginning of the implementation of the avatar and the process of getting used to and comfortable with the system workload could increase due to questions of seniors. Furthermore also older caregivers could have challenges with this new innovations. These issues are important during implementation: elderly need training and time to get used but (in)formal caregivers and volunteers as well.

The experiences from the caregivers during trials indicate that some of the anticipated benefits are indeed very likely to occur:

- The number of support alerts could decrease when using the VSP. This could affect workload reduction in the future. Elderly also call for support sometimes to get attention, this type of calls is likely to decrease.
- The VSP could affect loneliness (caregivers indicated this as very important).
- The VSP possible effects the feeling of autonomy of the elderly and thereby possible the quality of life.

Apart from the possible reduction of workload, these benefits can also help to reduce costs. A reduction of resources, both financial and human, is therefore possible. In some European countries, like Germany, there is a growing shortage of careworkers. Workload reduction can contribute to solving this problem.

3.2.3 Insurance companies

At the start of this project, we expected that the introduction of these technologies would have a positive influence on the health situation of elderly, and would therefore help to reduce costs of care and assisted housing, thus decreasing the costs for insurance companies. The effects in health situation, however, is a long term process, requiring a study of at least 5 years and follow up of the evolution of a large number of participants, in order to have valid results, something that was clearly out of the scope of the project. Nevertheless, we did collect elements during the trials that indicate that we can expect a

decrease of care consumption and reduction of support alerts. It has to be mentioned also that profits for insurance companies cannot be seen in isolation: in most care systems in Europe there are different insurance agents that cover different situations. For example in Switzerland the model is fragmented and there the care costs are covered by different sources, depending on the situation: in the hospital it is the medical insurance, in the home it is a social insurance etc. As a result one should take into account the total cost of care and not only the cost of one insurance covering a specific condition. In this sense a reform of the model might be needed in order to avoid the competition between insurance agencies and have unique and integrated insurance model.

3.2.4 Governments

For governments there is a similar benefit as for insurance companies: cost reduction of care because people can continue to live in their own environment and do not need to move to an elderly home. Furthermore, due to the improvement of conditions of the (working) relatives, there will be a reduction of the hours lost for the care of the elderly, which will increase overall productivity. Finally, another important goal of the Dutch government is to keep elderly as independent as possible, living in their own environment with the help of first the informal and then, when needed, formal caregivers. The VSP will possibly stimulate this independence and sense of autonomy and stimulates living at home for a longer period.

3.2.5 Relatives

For children and other relatives who often act as informal caregivers, the communication capabilities also offer peace of mind, which will lead to stress reduction. This can reduce cost of absence from work, which can save the community (and employers) money. In addition, this will also offer them 'peace of mind', especially when they are not living nearby the elderly.

During and after the trials the relatives have not yet been included in the evaluation. One can however argue that it is very likely that a positive effect on the health situation on the elderly also will have an effect on informal care consumption, and that this will result in a stress reduction on the side of relatives.

3.2.6 System integrators / producers

Suppliers of tools that support independent living for elderly can offer an additional benefit to their clients when integrating the VSP or components of the VSP in their solution.

In the market analysis, we for example already identified a number of potential partners for the tool that Noldus is developing, the EmotionFusion tool. Adding emotion analysis to social robots can improve the quality of interaction between the robot and the elderly person. When adding emotion analysis to remote support systems, this solution and potentially the caregiver will be able to respond more adequately to the emotional state of the elderly person. In both cases, adding emotion analysis will create an additional USP for the OEM partner, because this is a feature that is (still) unique.

3.3 Marketing strategy of the VSP

3.3.1 Product

The Virtual Support Partner (VSP) is a tool that provides a set of Care & Wellness, Guidance and Educational and Safety services. These can be personalized to end user needs and preferences, targeting daily activities. The VSP has an adaptable multi-modal avatar interface, which responds to the emotions of the elderly (based on facial and body gestures and speech). The avatar offers empathic responses through face emotions and voice intonation. This way, the daily activities support simulates the interaction with a real life partner. Main services developed within this project and implemented in the pilots are:

- Care & Wellness services, including medication service and agenda service
- Guidance services, including object location assistance and reminder
- Safety services: fall detection and “call for help”
- Co-Net service allowing care collaboration and also intelligent data dispatching and sharing to both the elderly and formal and informal carers

Adoption of such tools throughout Europe can be simplified by offering local language versions.

The augmented product consists of more than just the software and hardware described above, most important ones being:

- Training how to use the product
- Warranty
- After sales service
- Installation/delivery

In terms of product strategy, we will start with one basic product at the moment of release, with functionality comparable to what has been tested in the pilots. During the lifecycle of the product we will further differentiate in the years after the release, based on market feedback. For the first release we will use tablets, other devices may follow in future.

3.3.2 Pricing VSP

Different models are possible, for example time based subscription:

- For the end user, the elderly, the service could be offered on a monthly subscription base. This way, the investment is limited, and the subscription offers a constant source of revenues.
- Relatives may also be willing to contribute, since the system takes away part of their worries.
- Formal caregivers, such as care homes, could be expected to contribute because of time savings offered by the system.
- Insurance companies may be interested in offering this service to their clients, since the use of these technologies will reduce the cost of elderly care. In this case the product will not be sold per license, but in batches. The software will be sold on the

basis of annual subscriptions, and the price will depend on the number of licenses: the more licenses, the lower the price per license.

A first inventory shows that people think it is fair that multiple parties contribute, for example both the elderly and insurance companies, but also relatives and/or caregivers.

The time frame of the subscription needs to be decided on, this can be monthly or yearly, for example.

Another option is a one-time perpetual license. The advantage is that on a short term the revenues can be higher, but there is no sustainable income for the commercialising company (a subscription offers a steadier source of income, and makes it more affordable for the end-user in case they have to purchase it themselves).

In addition, there are other business models, like for example an advertisement model which allows free use of the software if the user accepts commercials. In this case we can propose two versions, one with limited services offered as a free service and a premium paid version with full services, or even a subscription based on actual usage and/or subscribed services instead of time period.

For the first release we will use the subscription model as a starting point, with a monthly fee of €10 (hardware has to be purchased separately). During the interviews with elderly after the pilots, the ones who mentioned they would be interested using the VSP, indicated this would be a reasonable price level. Three MRPS residents mentioned that they would pay for having the Miraculous-Life solution at home, provided that the system works correctly. One of those participants also mentioned that he would not pay more than 100 Swiss francs per month for having the system. At ORBIS, respondent mentioned a monthly fee of €10-20 or onetime fee of €200 would be reasonable.

Exact price levels can be optimized per country/region. Insurance systems and policies vary a lot between European countries, which forces us to introduce different business models in different countries.

3.3.3 Distribution VSP

How the solution developed within this project will be distributed, depends on the selected target group. Main options:

- Directly to the end user
- Indirectly via relatives
- Indirectly via formal caregivers
- Indirectly via insurance companies

A combination of the channels above is also possible. Distribution of the software and updates can be done online, but there will be personal sales involved when selling the product in cooperation with insurance companies and care organizations.

3.3.4 Communication VSP

Similar to the distribution and pricing strategy, the communication strategy also differs per target group. The communication mix will be a combination of online and offline actions, including:

- Emailing to buyers, end-users and/or other stakeholders. End-users for example can receive an offer to use a service for free during a trial period.
- Website offering information and possibly purchase options.
- Social media, amongst others blogs in relevant LinkedIn groups such as ALIANCE (European Ambient Assisted Living Innovation Alliance, 660 members), AAL (Ambient Assisted Living Joint Programme, 1100 members), or IAHSN (the Global Ageing Network, 1770 members).
- Relevant conferences (such as AAL Forum) and public exhibitions targeted at elderly.
- Product leaflets.
- Advertisements and PR in relevant magazines, either targeted at the end user or at other stakeholders. Examples: Senioren-magazine.nl (online magazine, NL) Plus magazine (NL), Zorg en Welzijn (magazine for care professionals, NL), Générations (magazine targeting seniors in French-speaking parts of western Switzerland), Exma INFO (magazine specialized in auxiliary measures edited in French and German by the FSCMA).

In the communication to elderly we need to position this service as a support tool, not as an aid, since the experience is that they are more eager to accept (and pay for) support tools, especially if they are not only for them.

3.4 Business Cases

Within this project, several tools and services are developed by project partners. It is possible to create a business case per solution, using the Business Model Canvas as developed by Osterwalder²¹. For all developing partners a description of the business canvas will be presented. For one organization, CiTARD, the business canvas will be presented also in a graphical way in order to illustrate the canvas principle. For the end user organizations (ORBIS and MRPS) setting up a business case is less relevant, although the system will be a very valuable showcase for these project partners and they want to be a supporting partner in the commercialisation by other partners.

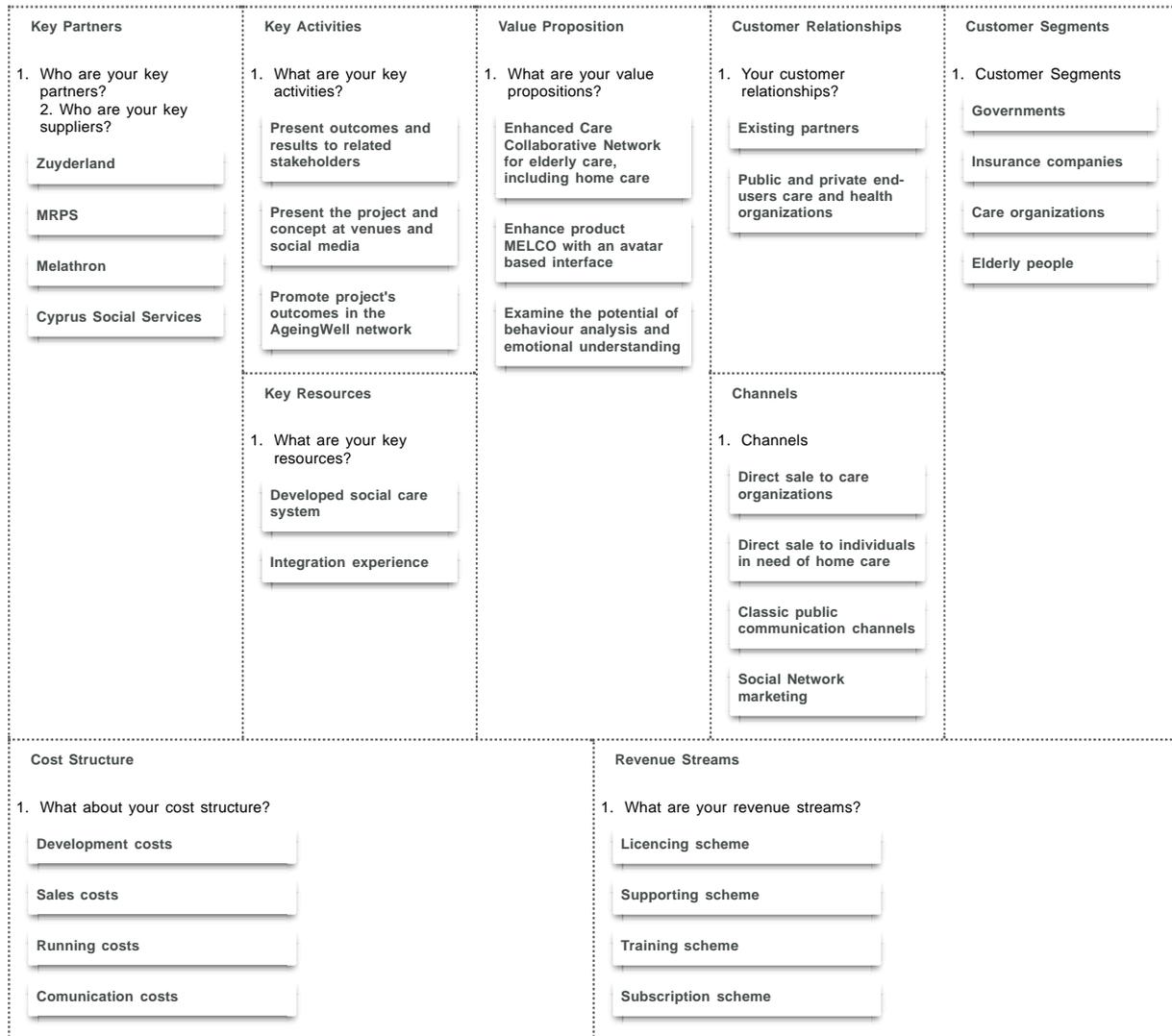
3.4.1 CiTARD

CiTARD's business focus in this project is both to enhance its Care Collaborative Network tool and exploiting the avatar interface to be used in CiTARD Active, a commercial product from CiTARD. Our interests are both in the exploitation of the project's overall outcome,

²¹ 2010. Business Model Generation, A. Osterwalder, Yves Pigneur, Alan Smith, and 470 practitioners from 45 countries, Wiley published

together with the other partners of the consortium, and in the exploitation of other technological components foreseen in the project.

Citard Business Model Canvas



Value Proposition

CiTARD foresees that its technological components used in the Miraculous-Life project will open the way to a range of new products and also in enhancing existing products. In more detail:

- Care Collaborative Network:
 1. CiTARD is expecting to enhance and adapt its already developed Social Network SoCoNet to a care network specifically for elderly care that will provide intelligent sharing system of alerts and information, to both the elderly and formal and informal caregivers, in the sense of instant communication and

mobilization of all kinds of relevant daily activities support services. In addition, SoCoNet proved to be a strong social tool that greatly improves the socialization of the elderly who are under professional care.

2. CiTARD is currently also focusing on the development of a novel home care product based on mobile technologies, which will provide an independent care tool for the older adult who is living at home. It aims at promoting socialization of the elderly in a community based (social network like) approach taking also advantage of the available wearable technology. It will enable the elderly to communicate, socialize, organize and attend events within his own network of contacts. It provides a hybrid, usable, self-managed calendar tool for reminders and notifications, and an integrated emergency network will allow the elderly to contact his selected carers, doctors, family etc. very easily. Additionally, people in the older adult's emergency network e.g. family, friends, and carers will be able to receive important updates about his/her location, emotional state and vital physiological information by utilising the wearable devices. Furthermore, based on an intelligent behavioural analysis the elderly will receive personalised support and notification through the tool. The CiTARD Home tool will ensure a safe home environment and a more active lifestyle for the elderly by improving his/her social life and confidence.
 3. CiTARD also foresees that the enhanced network can be integrated in other care tele-monitoring systems the company provides for chronic ill people at home, like the DITIS system that is used by the Cyprus Cancer Organization improving thus the quality of needed care collaboration.
- Avatar user interface component: CiTARD will examine the possibility to enhance the already existing products MELCO and CiTARD Active that provide care services for elderly, with the avatar based interface improving thus user acceptance of the product over the ageing process as the elderly will not need a touch screen to interact with the system.
 - CiTARD is further interested in examining the potential of how technologies in the areas of behaviour analysis and emotional understanding can reinforce the usefulness and acceptability of ICT services provided by other systems, reinforcing thus their take up in the market.

Key Partners

CiTARD sees that the exploitation of the project outcome will create new market opportunities for the company and will strengthen its already existing collaboration with the ORBIS partner and potentially also MRPS. At a national level, CiTARD plans to exploit the project's overall outcome with elderly care organizations the company is already working with in improving their care processes through innovative technologies. Such organizations include the Melathron, which is the oldest established (1959) privately held care service organization in Cyprus and also the Cyprus Social Services Center, the biggest public elderly care setup.

Key Activities

CiTARD will present the project outcomes and its results to related stakeholders (elderly care organizations, public sector service organizers, social security systems, insurance companies) as well as presenting the project and the concept in different international exhibitions, events, conferences and also through the use of social media. Moreover, as an active partner in the AgeingWell thematic network for the Market uptake of ICT for Ageing Well, it will promote the project's outcomes to related network members.

Key Resources

The key resources are the developed social care system and the experience of how to integrate collaborative care networks with other systems and components.

Customer Relationships

CiTARD sells their products directly to different public and private end-users care and health organizations. Existing partners will be used to attract more affluent customers.

Channels

The product is sold to care organizations that distribute to their residents. The same applies to individuals in need of home care, who benefit from using CiTARDs products for care and support

The following communication channels will be used: newsletters, emailing campaign, social media (blogs), website, online social presence. We will also visit relevant conferences and tradeshows to present our solutions and get in contact with potential clients and partners.

Customer Segments

Care organizations that support elderly people, and want to provide their caregivers or relatives a care network tool.

Governments: local governments with policies to provide social welfare, such as supporting home care.

Insurance companies: Insurance companies that have an interest in supporting independent living.

Elderly people

Cost Structure

There are four main components:

Development costs: costs to integrate into existing products.

Sales costs: Direct (personnel) for sales, training and support.

Communication: Personnel costs, dissemination costs (conferences/tradeshows, printing, demonstration sessions costs, etc.).

Running costs: Technical set-up for providing the service to clients (e.g., server maintenance costs, customization costs, etc.).

Revenue Streams

Different revenue stream models will be examined, with special focus on:

1. Subscription scheme for products managed directly by the elderly, e.g., via mobile apps and services subscribed by elderly. This model is now well established in the ICT industry and its simplicity attracts more potential users.
2. A licencing scheme is also envisioned for organizations. This will be based on the number of users (including caregivers) and site implementation numbers. This model allows clients to associate the cost of the service or product against the added value to each user of the service or product.

3.4.2 AIT

AIT as Austria's largest extra-university research organisation primarily acts as a technology and innovation provider for national and international partners from industry and commerce. In this regard our primary focus is to partner with system providers and facilitate a supply chain for the final product.

Independent from the overall Miraculous-Life business case, it is AIT's additional intention to use developed technologies/modules and license them to AAL solution and system providers in the described way.

Value Proposition

Besides working as integration WP leader on the overall integrated Miraculous-Life system AIT has especially worked on two technologies/modules that can be used in a range of products in the care technology market and have the potential to be exploited separately:

a) *Calling/SMS Service*

This service that enables users to call both users on the same SIP server, and users on conventional telephone and mobile networks (all over the world). It is also possible to send text/SMS messages to conventional telephone and mobile networks, and multimedia messages, including text messages to other SIP clients. It must be noted that, while it is free of cost to interact with users on the same SIP server, it costs to interact with users on conventional telephone and mobile networks like any other telephone network. In addition, it is also possible to play text to speech and pre-recorded audio messages during the call, starting automated calls and to configure Interactive Voice Response (IVR) using DTMF signals pressed during the call. In the case of this service the AAL solution and system providers are then able to integrate automatic calling and notification services to their existing packages.

b) *Windows/Sleeping Reminder based on HOMER (comfort and safety services)*

The Window Reminder was developed to provide a reminder functionality to facilitate 1) opening the windows on a regular basis or based on certain (environmental) conditions for proper air circulation (fresh air), and 2) reminding about open windows that should be closed due to a dropping or raising temperature in the room or if the user is about to

leave the apartment. Based on these two use cases, the window reminder can be considered a safety service (i.e. don't forget to close the windows before leaving the home) as well as a comfort service for monitoring and maintaining fresh air. The status of the windows (open/closed) is determined using contact closure sensors. Additionally it would be possible to add motor driven actors that are able to automatically open and close windows, which could be triggered by temperature, humidity or CO2 sensors, or a combination of those. Furthermore, the user could open and close the windows from outside by using a smartphone app that is connected to the HOMER installation in the apartment.

The Sleeping Reminder was developed to determine whether a person is lying in bed (and sleeping) at a specific time. Using presence detection sensors placed under the bed mattress, it is possible to sense if the bed is occupied. This functionality allows the sleeping reminder to be used as a safety service, by monitoring the sleeping behaviour of a person (e.g. if a person is not able to leave the bed in the morning). In case of an unusual sleeping pattern or deviations from normal behaviour being recognized, an alarm can be triggered. The sleeping reminder can also be used as an assistive service that reminds a person to go to bed at a specific time.

The Value Propositions for a) and b) are that the AAL solution and system providers can integrate these new services within their AAL products and portfolio. For their end customers (older adults) it even increases usability and barrier-free access to e.g. calling services.

Key Partners

The key partners are:

a) *Calling/SMS Service*

For implementing the Calling/SMS Service to work with traditional phone numbers and telephone service providers a running VoIP-Gateway needs to be involved. Companies (PSTN gateways) offering this service are available on the market.

b) *Windows/Sleeping Reminder based on HOMER (safety services)*

For this service sensor manufacturers and companies will be needed. The integration of these sensors is facilitated by HOMER (AIT-developed integration and recognition platform) and can be performed by AIT.

Key Activities

First of all the prototype modules for a) and b) need to be stabilized and tested to meet the requirements of a marketable product/service. This can already be done on contract basis with an interested customer already or by a pre-investment from AIT.

A permanent support needs to be set-up and offered to the customers.

Contractual frameworks need to be generated and the business model needs to be established by business development and marketing activities (including promotion material, branding, etc.).

Key Resources

A major key resource needed for this business model is an experienced software developer and engineering team.

For running the Calling/SMS Service it is needed to set-up/use a SIP-Server which can either be self-hosted by the customer or used from a third party provider.

A download channel for the software modules must be established by the technical team or to be outsourced.

Finally a Business Developer familiar with the AAL market needs lead the process by involving marketing specialists.

Customer Relationships

For both value propositions (see above) it is important that they are actively offered to potential customers and advertised. This is supported by an active Business Development from AIT which has an established network to national and European potential customers and networks. Furthermore the solutions will be promoted via specific AAL stakeholder platforms where companies take part. Another channel are AAL and fairs and events.

AIT will offer a high-value technical support, maintenance and a well-written and easy-to-use documentation for the software packages.

Channels

For both value propositions (in both cases software modules) the customers can buy the packages on a license-based fee. The hardware components for Windows/Sleeping reminder can be bought directly from sensor companies/manufacturers by the customer. E.g. AIT will provide the latest releases of the software modules as downloads on a server where registered customers have access to or parts can be offered via existing online platforms (e.g. PlayStore). The documentation comes with it.

Customer Segments

The customer services for a) and b) are primarily AAL solution and system providers. This is an emerging market but the number of companies offering AAL solutions is increasing. AIT is focused on a B2B market which then serves the care and user organisations or the private sector.

The care technology providers should have a standing in the market and offers products, potentially for care facilities. The AIT technologies can be integrated into their products, or into new products that suit the portfolio of the care technology providers. AIT can assist and take over the integration (on contract basis) if the customer requires that.

The end customers are primarily assisted living facilities and their residents. Another end customer segment are persons-in-need living independently at home, respectively their relatives, who gain a level of safety from using the developed product.

Cost Structure

First of all, the costs for transferring the prototypes to a marketable product need to be taken into account.

For the sold product/service a permanent maintenance, bug-fixing and support will be required. For further feature implementation resources will be needed.

In some cases costs for SIP Server set-up and maintenance need to be calculated (see revenues).

For business development and marketing including PR expenses need to be taken into account. If the distribution channel will be set-up on an AIT server costs have to be calculated respectively.

Revenue Streams

For both AIT value propositions the revenue streams are primarily the input from direct sales based on a license-based fee (AIT will go for a non-exclusive licensing model). The achievable prices still need to be calculated and negotiated.

If the customers need support for setting up the SIP-Server and its maintenance AIT can offer this on a contract basis.

Another income channel will be service and maintenance contracts (to be negotiated individually).

3.4.3 Fraunhofer

Fraunhofer primarily acts as a technology and innovation provider for partners from industry and commerce. In this regard our primary focus is to partner with system providers and facilitate a supply chain for the final product.

Independent from the overall Miraculous-Life business case, it is our intention to use developed technologies and license them to a system provider in the described fashion.

Value Proposition

Within Miraculous-Life Fraunhofer has developed a set of different technologies that can be used in a range of products in the care technology market:

- Improved Fall Detection - this depth camera based method is able to estimate fall events with a high degree of certainty, by monitoring the velocity of joints of a user.
- Improved Activity Recognition - this depth camera based method uses long-term analysis of data to infer various typical activities of seniors in a household.
- Improved Object Localization - this depth camera based method identifies objects based on shape and size within an environment and helps users in finding them again.
- Dangerous Object Advisor - this depth camera based method detects dangerous objects within potential walking trajectories and can warn users or care takers.

Key Partners

Fraunhofer as primary technology providers aims at offering the developed solution as a component for existing care technology providers to either improve their products, or develop completely new systems.

The care technology provider has an existing standing in the market and offers vision-based products, potentially for care facilities. The Fraunhofer technologies can be integrated into the product, or into new products that suit the portfolio of the care technology providers.

The supplier or system manufacturer is required to produce the market-ready products for the care technology providers. This can be a partner within the networks of the care technology provider or Fraunhofer that can reliably integrate the technologies into a product.

Key Activities

Two primary activities are required. The first is the integration of the technologies into a system that is ready for sale. The second is the creation of the supply chain that will manufacture and package the product for sales.

Key Resources

The key resources within this model is the IPR on the unique algorithms developed within the Miraculous-Life project, based on background IP from Fraunhofer. An experienced development team is able to create a reliable product from those.

Customer Relationships

The product should be advertised primarily to existing customers of the care technology providers. Given the high-tech character it should be targeted towards high-quality care facilities in the upper price range that attract more affluent customers. New customers can be found by display on suitable trade fairs.

Channels

The product is sold directly to the different customers.

Customer Segments

The customers are primarily assisted living facilities that can distribute items to their residents. The same applies to care facilities and their residents. A third segment are persons-in-need living independently at home, respectively their relatives, who gain a level of safety from using the developed product.

Cost Structure

There are three main components. The system has to be developed into a product, typically in a development contract between the care technology provider and Fraunhofer. To license the background IP, a licensing contract between the two parties has to be drawn up. Finally the care technology provider has to source the system from an integrator.

Revenue Streams

The revenue streams are primarily the input from direct sales and to a lesser degree maintenance contracts. It can be foreseen to have upgrade options available.

3.4.4 UCY

UCY has a long term expertise in carrying out research and development. UCY also has experience in working together with the Cyprus IT sector in promoting research outcomes to the healthcare sector (public and private).

DMAC lab (Data Management in Mobile and Adaptive Computing) is part of the Computer Science Department of the University of Cyprus (UCY) and it was established in an effort to promote and coordinate research activities in all areas of (i) Data Management in Mobile Computing and Sensor Networks, (ii) Semantic and Cognitive Research Adaptivity Technologies, and (iii) Ambient Assisted Living.

Value Proposition

Within Miraculous-Life, UCY has developed a set of services that can be used in products in the care technology market:

- ICT Services – these services are focused in the area of AAL supporting elderly (65+) daily activities and safety needs, while the elderly person goes about his normal daily life.
- Collaboration Network – UCY is expecting to enhance and adapt the Social Network SoCoNet for further research in future projects.
- New Academic Courses – UCY is expected to integrate gained knowledge in future curriculum courses to bring students up-to-date with technologies in the AAL area.

Key Partners

UCY as primary research organization in Cyprus aims to promote gained knowledge in the local market through consulting and future research projects.

DMAC lab as part of the Computer Science Department of the University of Cyprus will be responsible for further development and maintenance regarding the Miraculous-Life concept, services, processes, technologies and overall solution.

Key Activities

The key activities of UCY will focus on disseminating the project results via publications and presentations in the EU and international, industrial-driven but also academic journals, conferences, workshops, as well as in academic forums. Academic dissemination will also aim to bring technologies, developments and the research carried out in the project to the students via academic courses. Finally, UCY will undertake any system integration that may be needed in the abovementioned key activities.

Key Resources

The key resources of UCY are the developed data structures and algorithms that support the abovementioned services and the experienced development team of the DMAC lab.

Customer Relationships

UCY is targeting conferences to promote any research activity, further research promotion in Cyprus' industry through consulting and its students through new curriculum courses.

Channels

The gained knowledge will be channelled in future research projects, into new curriculum courses and into conferences by posting public dissemination material like leaflets, publications, posters, flyers, reports and presentations.

Customer Segments

The customers are (i) assisted living facilities, (ii) local care facilities and their residents and caregivers (formal and informal) and finally, (iii) the industry through consulting activities.

Cost Structure

The cost of maintaining and enhancing the solution is mainly concentrated in license fees for the software used in the development, the running cost of the DMAC lab and finally the fees of the researchers involved in the development.

Revenue Streams

Revenue stream models include (i) consulting activities in the industry, (ii) participation in new research proposals, (iii) participation in spin-off companies that want to exploit the gained knowledge and (iv) any upgrades and support required by the system users.

3.4.5 Noldus

Within Miraculous-Life, Noldus has developed a solution for assessing the emotional state of an elderly person in an assisted living environment. This assessment is based on several components: speech, posture, and facial expression. Facial expression is analysed remotely via the FaceAnalysisServer. For linking different components we are using the N-Linx protocol (the successor of NCF, also developed within this project). The fusion of different aspects of behaviour will create a more reliable robust emotion analysis which will work under more different circumstances than an emotion analysis tool that is based on one component.

Value Proposition

First of all: Robust and reliable assessment of emotion. Combining different modalities for analysing the emotional state of a person, helps to create a more stable, robust and reliable measurement of emotions. This gives caregivers and care providers better insight into the emotional state of people receiving care. This helps to make a better judgment of the type of care needed, and when to offer this, thus increasing efficiency. For the elderly people involved, this will increase their sense of safety. This can help to increase perceived quality of living, which also helps to prevent degradation of skills and capabilities.

Second care-cost reduction: Introduction of these technologies can have a positive influence on the health situation of elderly, and may therefore help to reduce costs of care and assisted housing. This is a benefit for insurance companies, and care and governmental organizations. The improved efficiency and continuity of care could result in a reduction of demand of care resources and thus also reduce care burden.

Key Partners

VicarVision is the developer of the FaceAnalysisServer, one of the components within the EmotionFusion component. Noldus has developed the communication between the EmotionFusion tool and FaceAnalysisServer.

Key Activities

Two primary activities are required. First the development of the EmotionFusion Tool should be completed. After development of the prototype during the Miraculous-Life project, Noldus will complete the tool and plans to release it as tool for analysing the emotional state of persons. Next, Noldus will release the EmotionFusionTool as an OEM tool that can be embedded in a set of products and services. This will be done after testing and validation. The full product will also include documentation. The release will be supported by a range of PR & communication activities, with the aim to create awareness.

Key Resources

Fusion software: Experience how to integrate different data streams into one system, and how to generate information about behavioural states from combining all the available data. Also the brand name is important: Noldus is well known as a provider of systems for observing behaviour for over 25 years, and has a worldwide distribution network. This network in combination with the communication capabilities of Noldus will be very valuable in introducing the product to the market and setting up OEM partnerships.

Customer Relationships

Indirect to OEM partners: Noldus does not have the right channels for directly sell to end-users, relatives or care givers who need a ready-to-use tool. Therefore we will cooperate with partners who do have access and have more experience in this market. The tools developed on OEM basis can also offer additional services which can be optimized based on the emotional state of the elderly person, and will be more effective than comparable tools without this functionality. This offers the OEM partner a new USP.

Governments and Insurance companies: Governments and Insurance companies may want to adopt this technology as a standard for developing systems and services for enabling ambient assisted living.

Channels

Partner managers will establish relationships with potential OEM partners for embedding and reselling the EmotionFusion tool in products they offer for AAL applications. Noldus' direct sales network can contact governments and insurance companies directly.

In order to create awareness, different tools will be used: newsletters, emailing campaign, social media (blogs), website, press releases. In addition we will visit relevant conferences and tradeshows to present our tools and get in contact with potential clients and partners.

Customer Segments

OEM partners: Developers of tools and systems for supporting independent living. Their customers can be elderly people, their caregivers or relatives, but also insurance companies or governmental organizations.

Governments: Often local governments contribute in developing tools that enable ambient assisted living.

Insurance companies: Also insurance companies have an interest in supporting independent living.

Cost Structure

There are four main components:

Development costs: costs to complete the EmotionFusion Tool, including documentation.

Sales costs: Direct (personnel) for sales, training and support and out of pocket (travel, office space, etc.)

Communication: Personnel costs, plus out of pocket costs (conferences/tradeshows, printing, webhosting, etc.)

Running costs: Server hosting for the FaceAnalysisServer (when running in our servers).

Revenue Streams

In order to make sure costs of support during implementation are covered, we propose to introduce a start fee for people who want to start embedding the EmotionFusion tool into their application. This start fee will have two components: an initial fee that has to be paid only once, plus a yearly fee for support.

In addition, there will be a subscription model, which offers the possibility to create a sustainable income flow. Licenses can be sold in batches, price per batch can depend on batch size and time period. This model makes it also more affordable for partners who want to use this technology: the main cost component will depend on how many users there are, which decreases the financial risk.

3.4.6 UniGe

University of Geneva (UniGe) is an academic partner that mainly acts as a technology and innovation provider, and would directly sell its technologies and research results to commercial technology partners. In the case of research results and technologies resulting from Miraculous-Life, it is preferable to sell the results to care technology providers that would integrate these results into their existing or new products.

Value Proposition

Within Miraculous-Life UniGe has developed a set of technologies that can be used in a range of products in the care technology market as well as in other markets where avatar technologies are used:

- Improved Dialogue Manager – The dialogue manager combines theories from linguistic (regarding information states, grounding and turn-taking) and social sciences (regarding belief desire intention and emotional decision making), implements human-like cognitive and affective behaviour (emotions, reasoning, etc.).
- Services Dialogue Workflows – Dialogue workflows defining and implementing the user interaction with the OSGi Services or Web Services as well as implementing the behaviour of the services.
- Improved Speech Recognition component – SAPI based speech recognition components managing the speech interaction with the user as well as implementing filtering and sound streaming techniques. This work is a collaboration of UniGe and Noldus.

Key Partners

University of Geneva (UniGe) can be seen as primary technology provider offering the developed solution as a complete package for care providers to improve their care services or for technology providers to improve their products portfolio. The care technology provider has established itself in the market for assistive products and potentially for care facilities. UniGe's technologies can be integrated into their products, or can be used to develop totally new products.

Key Activities

UniGe's key activities are mainly the integration of the technologies into a system that is ready for sale and the creation of the supply chain that will manufacture and package the product for sales.

Key Resources

The key resources within this model are the IPR on the avatar interaction technologies developed or improved within the Miraculous-Life project based on background IP from

UniGe, and an experienced development team in the related research domain able to create a reliable product from those technologies.

Customer Relationships

UniGe's technologies should be primarily sold to existing customers of care technology providers that would license and integrate UniGe's technologies into their products.

Channels

UniGe's technologies will be sold directly to care technology providers who on their turn would sell it to their care receiving customers.

Customer Segments

The final customer segments for UniGe's technologies are assisted living facilities, care facilities and their customers, and end-users directed who need support for living independently at home.

Cost Structure

The costs for UniGe's technologies are mainly the research and development costs of the different technologies, maintenance and support costs of sold technologies.

Revenue Streams

The revenue streams for UniGe technologies are primarily the input from direct sales. Further, maintenance contracts may also be another source of revenue.

3.4.7 Zoobe

Zoobe offers 2D and 3D animated messaging content for messaging services for entertainment-based communication. For messaging platforms Zoobe provides solutions to engage and thereby retain their user base by accentuating playful and emotional messaging. For entertainment brands Zoobe provides a bridge into digital communication to increase the touch points of their brands.

Value Proposition

- Zoobe GmbH has used and adapted its existing technological framework of voice-recognition to facilitate the Miraculous-Life project in its ambition to bring avatar technologies to the care market.
- Zoobe focused on the creation of product features relating to community features for video streaming, the connection of external video platforms and communities, user generated content and message feedback and the Zoobe platform.
- Zoobe also examined the possibilities of extending the program into other areas such as gamification and 3D model generation.

- Lastly Zoobe promotes the project through the various social media channels and connections at its disposal, being unique qualified to do so given its user base and outreach.

Key Partners

Zoobe is confident that the usage and implementation of the project will strengthen the working relationship that which has formed between Zoobe and its partners in the Miraculous-Life project, notably including CiTARD, Noldus, MRPS and ORBIS.

Key Activities

Three main activities are recognized: firstly and most importantly the creation of further product features and the integration in connection to external video platforms and communities. The enhancement and support of such communities are also essential components. Secondly, the marketing efforts involved in creating further awareness of the project and thirdly the investigation into the opportunities of areas with regards to interactivity and gamification.

Key Resources

Key resources include the Zoobe software and the previously developed technology thereto underlying and supporting the software development of both the Miraculous-Life project and the Zoobe app. In addition, Zoobe's network of followers and direct access to users connected to over 10 million devices where the Zoobe app has been installed.

Customer Relationships

Zoobe is targeting users in the age groups 55+, users aged 30 – 40 and government agencies.

Channels

- The product is made available to health and care companies which take care of their (elderly) occupants. This also applies to those in general need of home care.
- Communication channels include: social media, blogs and newsletters.

Customer Segments

The customers are (i) local care facilities and their residents and caregivers (ii) governments (iii) insurance companies.

Cost Structure

Technology: The content development engine and server network are the most crucial and largest non-comp. cost drivers. The monitoring of server capacity and continuous

investment in state of the art technology is therefore essential. Other costs include communication and staffing.

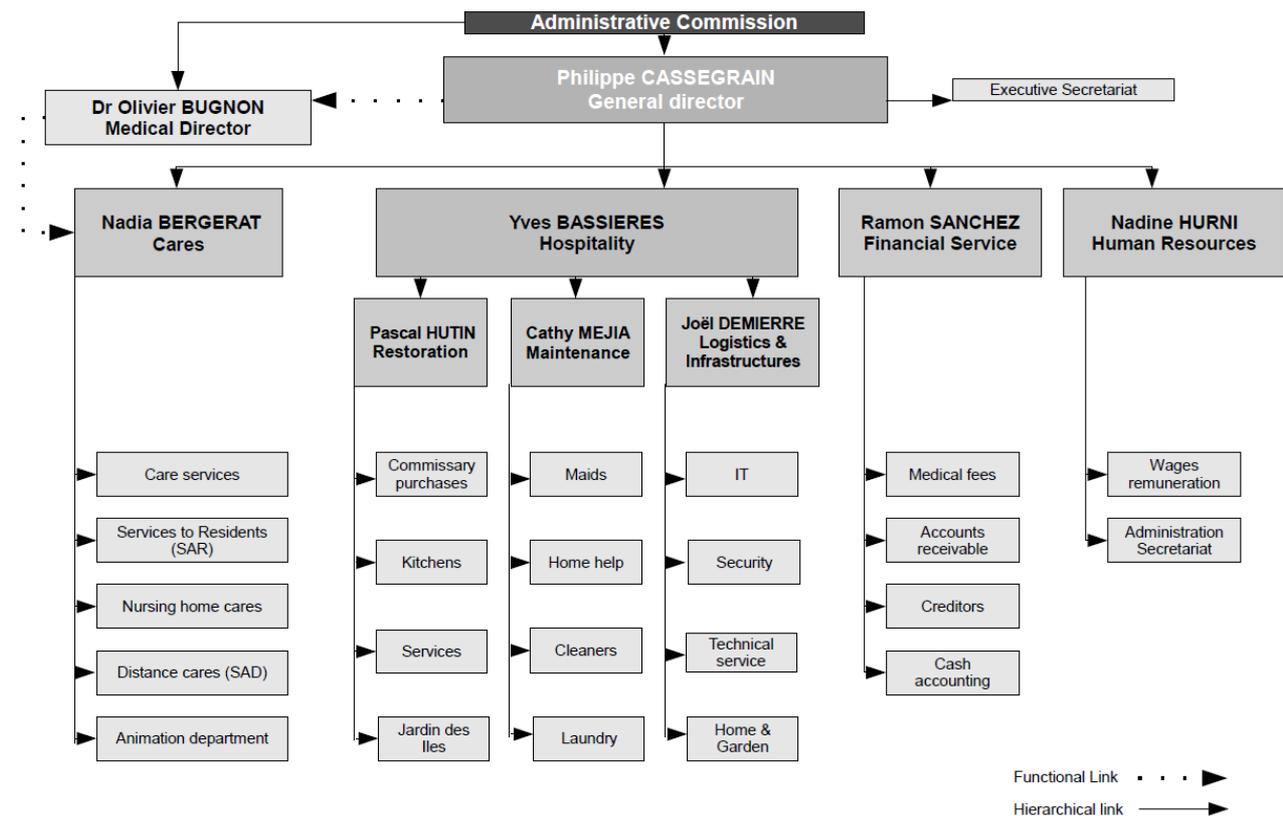
Revenue Streams

- B2C: The technology and the development thereto can be sold to third party vendor via a subscription or a licensing model. In addition, tech serving services can also be included in any servicing contract.
- B2B: Subscriptions and servicing can also apply to directly to consumers, for instance via mobile apps. This is already a well-established practice and could be served well within the current functionality / setup of the project. The advantage to a subscription model would be the additional benefit of easier scalability through user acquisition.

3.5 Business models user organizations

3.5.1 MRPS

Departments and needs: the figure below represents the MRPS organigram.



MRPS organigram validated by the Administrative Commission on the 07.09.2016.

The Miraculous-Life solution could answer to multiple needs identified in different MRPS departments. The departments that could benefit from the Miraculous-Life services are the following:

1. Soins à Domicile (SAD) Résidences. Composed by nurses and auxiliary nurses, the SAD team provides home care 24/7 on-demand to the MRPS residents. The use cases “medication reminder”, “periodic advice”, “fall detection”, “dangerous objects adviser”, “dangerous situation adviser”, “call for help”, “object location assistance and reminder”, “notification”, “physical activity” could potentially reduce care costs, caregivers’ workload and stress.
2. Animation MRPS. The animation team organizes every week different activities for MRPS residents including gym sessions, café rencontres, knitting activities, memory trainings, card games, tai chi, and concerts. The animation team communicates activities and events to the residents through the MRPS journal “L’Echo de l’Age d’Or” and through announcement boards – see figure below. During the user need interviews, several seniors mentioned that they occasionally forget to participate in activities organized by the animation department; suggesting that the communication channels used by the animation team could be improved. The “group activity” service could potentially increase awareness and participation in social and physical activities proposed by the animation department, leading also to reduced care costs on the long-term. Several members of the animation department will use the caregivers UI in order to promote animation activities within the Miraculous-Life solution.



3. Restauration/Cusines. In MRPS, residents consume at least one meal per day in the dining rooms, located in Colladon and Trembley. Residents get to choose which items on the menu they want to eat using a paper form – see figure below. The “message system” could potentially be used in order to optimize this process: i.e. to communicate the menus to residents and collect their preferences.



Appartement No :
Table :

Résidence Colladon

PLAN DE MENUS SEMAINE DU 30 MAI AU 5 JUIN 2016
Veuillez déposer le coupon dans la boîte entre les deux colonnes de la salle à manger en mettant une croix dans les cases prévues,

A REMETTRE JUSQU'AU MARDI 17 MAI 2016

Lundi 30.05.2016

- Menu I
- Menu II
- Potage
- Entrée
- ½ Portion
- Soir

Menu I (Lundi 30.05.2016)

Velouté de volaille
ou
Fenouil mariné

Sauté de veau à la sauge
Purée de pommes de terre – Tomates rôties

Fruit

Menu II (Lundi 30.05.2016)

Velouté de volaille
ou
Fenouil mariné

Ramequin au fromage
Salade de saison

Fruit

Mardi 31.05.2016

- Menu I
- Menu II
- Potage
- Entrée
- ½ Portion
- Soir

Menu I (Mardi 31.05.2016)

Potage Faubonne
ou
Salade aux noix

Osso bucco de porc crémolata
Papillons – Céleri branche étuvé

Glace

Menu II (Mardi 31.05.2016)

Potage Faubonne
ou
Salade aux noix

Risotto aux bolets
Salade cabus

Glace

Mercredi 01.06.2016

- Menu I
- Menu II
- Potage
- Entrée
- ½ Portion
- Soir

Menu I (Mercredi 01.06.2016)

Potage de légumes au cerfeuil
ou
Champignons à la grecque

Demi-coquelet à la diable
Pommes lyonnaise – Fondue de poireaux

Crème au Grand-Marnier

Menu II (Mercredi 01.06.2016)

Potage de légumes au cerfeuil
ou
Champignons à la grecque

Salade aux accras de morue, coulis de piquillos

Crème au Grand-Marnier

4. Gestion & Accueil Service aux Résidants (SAR). The SAR team aims to accommodate the various residents' needs of daily living – including emotional and administrative support. The use cases “contact list”, “message system”, “notification” could encourage an efficient communication between the SAR and the residents, reducing thus caregivers' workload and improving the quality of services provided to the residents. SAR members are also interested in using the Miraculous-Life system in order to send on a regular basis the “joke of the day” and the “today's weather”. In addition, SAR members could also use the Caregiver UI to add and remove items in the seniors' agenda, helping them to schedule their activities and appointments. The Miraculous Life system could also help the SAR to identify resident's emotional distress at home – persisting blame, fearful/stressful, sadness affective states – allowing them to intervene when necessary. During the trial, in case of emotional distress, the VSP will propose to the resident to call or write a message to SAR members.
5. Intendance. This department is responsible for cleaning the residents' apartments, at least twice per month. The members of this department could also use the Caregiver UI to send notification or to access to the seniors' agenda, in order to inform and remind them about the cleaning sessions.

3.5.2 ORBIS

The Miraculous-Life solution could answer to multiple needs identified by different departments within ORBIS. The departments that could benefit from the Miraculous-Life services are the following:

1. Caregivers: This department exists of care coordinators, nurses and elderly care physicians. These caregivers provide 24/7 care to the elderly home and care on demand to the elderly in the assisted living apartments. The use cases “medication reminder”, “periodic advice”, “fall detection”, “dangerous objects adviser”, “dangerous situation adviser”, “call for help”, “object location assistance and reminder”, “notification” could potentially reduce care costs, caregivers' workload and stress.

The Miraculous-Life system could also help the caregiver to identify elderly's emotional distress at home – persisting blame, fearful/stressful, sadness affective states – allowing them to intervene when necessary. During the trial, in case of emotional distress, the VSP proposes to the resident to call or write a message to caregivers.

2. Animation ORBIS The animation team organizes every week different activities for elderly like bingo, reading the newspaper, tablet training, yoga, knitting activities and concerts. The animation team communicates activities to the elderly through the Hoogstaete journal and posters in the hallway – see figure below. During the user need interviews, several elderly mentioned that they occasionally forget to participate in activities organized by the animation department, caregivers mentioned this happens often; the “group activity” service could potentially increase awareness and participation in social and physical activities proposed by the animation department and by adding in their agenda the VSP reminds them of this activity. This could also lead to reduced care costs on the long-term; by adding this in their agenda they get reminded for this activity which saves the caregiver time and thus workload and stress not to visit them to remind them. Several members of the animation department will use the caregivers UI in order to promote animation activities within the Miraculous-Life solution.



3. Reception. The reception of the elderly home receives packages and sometimes messages for elderly at Hoogstaete. The use cases “contact list”, “message system”, “notification” could encourage an efficient communication from the reception to the elderly to inform them about their messages or the package they can pick up at the reception. This could save the reception time to get in contact with the elderly. In addition, the reception could also use the Caregiver UI to add and remove items in the seniors’ agenda, helping them to schedule their activities and appointments like the doctor,

hairdresser or physiotherapist. This helps the elderly to remember their appointments and saves caregivers time in reminding them.

4. Physiotherapy. This department gives physiotherapy to some of the elderly and motivates them to do their exercises and stay active. The use case “physical activity” supports the physiotherapy by keeping the elderly motivated to do his exercises and by showing the video support them to do the exercise in the correct way. In the use case “first interaction of the day” some elderly (those who have start pain) get a message to remind them to start the day with some exercises. These exercises help the elderly to be more fit during the day. Both use cases could potentially reduce care costs and physiotherapist’ workload.

4 Exploitation plans

4.1 Time to market

The next 4-5 years are critical in the evolution of the market and adoption of more sophisticated ICT applications that are tackling the ageing problem. Miraculous-Life will be well placed to benefit from this emerging market by having the first version of the industrial system ready to commercialize 4 to 5 year(s) after the project end. This estimation is based on the fact that the solution will be based on the emergence of mobile tablet devices in the market and that a number of elderly people are already making use of such devices. It is also foreseen that in the next years more advanced and cost effective mobile device technologies (i.e. tablets, Kinect) will be provided with high resolution cameras for improved quality.

In order to minimize time to market, Miraculous-Life makes use of a technical phase based approach providing for early in the project deployment of the scheduled pilots (originally planned M08 and M24) guaranteeing their successful operation. The evaluations undertaken in the two pilots show the effects on the individual. Calculations on the cost/benefit of using such solution cannot yet be made. Nevertheless, as a result, we do have services, but also evaluations, which give supportive evidence about their usability and applicability, that will help to accelerate their take up in the market.

4.2 Sources of finance for commercialization

The first big customers to take up the system if it works well are the two participating end-user organizations ORBIS and MRPS. Both are working close with insurance companies for the provision of elderly homecare. Already ORBIS is chosen by CZ, a big insurance company, as the Living Lab to test eHealth solutions. In this role ORBIS will in cooperation with CZ implement eHealth solutions and test them via a model developed by CZ and ORBIS together. In this model research for the eHealth solutions will be done for patient satisfaction, the care paths, clinical efficacy, organisational and care costs. For the eHealth solutions which have good outcomes based on this research, CZ will look for structural financing via the insurance. If Miraculous-Life is successful this can also be further tested via living lab cooperation between ORBIS and CZ. This can be a starting point of stimulating other insurances in other European countries in allocating budget for introducing the system in the elderly care process.

The assumption that other organizations will be willing to invest in these developments, is also supported by findings of other projects in this area. Examples:

- FlevoMind/Connected Vitality Network, a network aiming at remote support of elderly and psychiatric patients, was supported by CMO ('Centre for social development' in Flevoland, the Netherlands).
- Virtask, a virtual assistant (avatar) for agenda control (reminders of meetings and medicine), control of home automation, video calling with caregivers or relatives, etc., is supported by the province of Gelderland and the city of Deventer (both in the Netherlands).
- GoOV is an app for assistance in using public transport. Local communities provide funding so that their citizens can get access to this tool.

- Insurance company CZ has invested in care robot 'Rose', also in the Netherlands. This insurance company has dedicated funding ('CZ Fonds') for supporting such initiatives.
- In the Netherlands it is becoming more common that the government or insurance companies pay for automation technology that enables elderly to live independently. Solutions such as a robotic arm or fall detection can even be part of the basic insurance if there is a medical indication²².
- In Germany the most important deciding factor is the listing in the official aid catalogue (Hilfsmittelkatalog) of care insurance companies that is followed by all public insurers. In the last years various technical systems have been added to this catalogue²³. It would be important to achieve a listing.
- In Germany certain insurance companies extend from the existing catalogue for innovative systems. One example would be the health-I initiative by Techniker Krankenkasse²⁴. They have funds available to proliferate solutions among their customers.

4.3 Exploitation scenarios

As stated in section the paragraph about Segmentation, we estimate that in 2020 the number of potential end users will be 10 million people in Europe. With this figure as a starting point, 3 different scenarios have been drawn in order to enable us to estimate possible ROI of the VSP:

1. Optimistic scenario. Assumptions:
 - a. Introduction of a solution middle of 2020.
 - b. Required development 2 persons/year until release
 - c. Average 50.000 users in the second year after release.
2. Average scenario. Assumptions:
 - a. Introduction of a solution middle of 2021.
 - b. Required development 3 persons/year until release
 - c. Average 40.000 users in the second year after release.
3. Conservative scenario. Assumptions:
 - a. Introduction of a solution middle of 2022.
 - b. Required development 4 persons/year until release
 - c. Average 30.000 users in the second year after release.

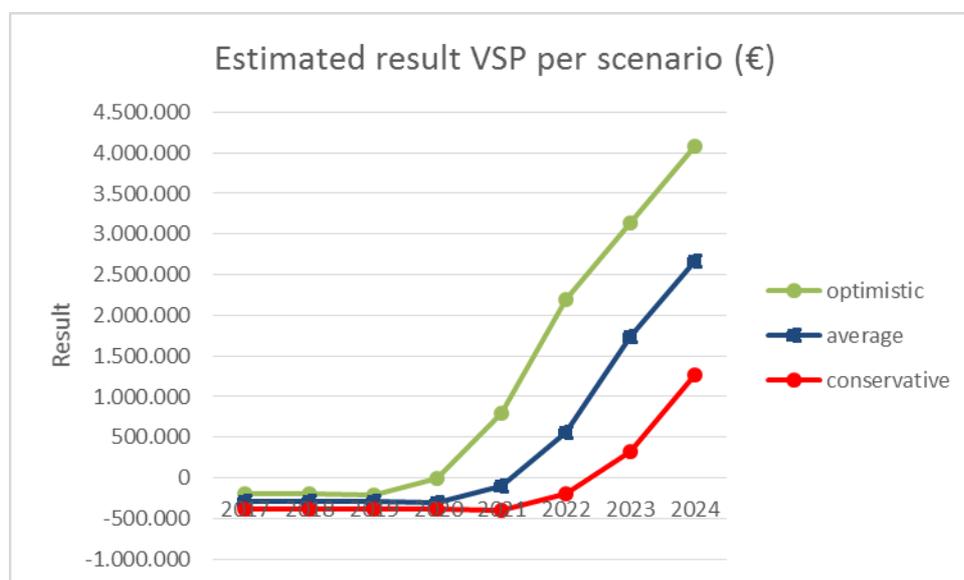
Based on a subscription price of this service of €10 per participant per month, turnover would increase to €10 million in 2024 in the most optimistic scenario. In the pessimistic scenario, the turnover is €3,6 million in 2024. Break-even point is between 2021 and 2025, depending on release date, required development time and adoption speed. The graph below shows

²² https://www.regelhulp.nl/bladeren/_/artikel/domotica-technische-hulpmiddelen-thuis/

²³ https://www.vdivde-it.de/publikationen/studien/unterstuetzung-pflegebeduerftiger-durch-technische-assistenzsysteme/at_download/pdf

²⁴ <http://award.handelsblatt.com/healthi/>

the development of turnover in the three scenarios. Detailed tables with calculations can be found in Appendix B.



The price of €10 per month seems feasible when looking at subscription prices for other services in the AAL domain. This is a basic price for the first release with a functionality comparable to what has been implemented and piloted so far at MRPS and ORBIS. In order to create awareness and increase penetration speed, it is possible to start offering the service for free for a number of months, which can be considered promotional costs. After the first release, additional functionality can be added on a modular basis. These additional features can be offered at a premium price.

The subscription price is for the use of the s/w only. Costs for required hardware (tablet) and supporting services such as installation and user training are not included in the subscription.

4.4 Individual exploitation plans

4.4.1 AIT

The main interest of AIT is to exploit the project knowledge, follow-up co-financed research activities and also follow-up contract research and revenues based on licensing agreements. Within Miraculous-Life, AIT will establish and extend basic components and modules for AAL platforms (especially in the domain of service integration) and will exploit them either on a license fee based model or by applying an open source licensing model to ensure wide usage of the outcomes. The key segments for these exploitation channels are further R&D institutions active in smart home integration and solution providers looking for tools and modules facilitating their work.

AIT will further use its strong links with other projects and activities related to AAL service platforms, like the universAAL and AALuis projects and the related Ambient Assisted Living

Open Association (AALOA), to introduce Miraculous-Life concepts and outcomes into their running actions.

Moreover, the developed safety services, making use of the HOMER (HOME Event Recognition) middleware platform, will be fed into Austrian “Testregion” projects (where existing and newly set-up smart homes for elderly will be equipped and powered by AAL solutions by AIT) and other emerging AAL pilot and demonstration sites in Austria. AIT has been leading a regional pilot called “moduLAAR – Leichter Wohnen”, where 50 flats will be equipped in close collaboration with the powerful care organization Arbeitersamariterbund and is involved in a second “Testregion” called WestAAL in the western part of Austria. Furthermore the HOMER platform and related safety services will be introduced AAL solution providers in Austria. Other modules developed by AIT within Miraculous-Life will also be offered to selected solution providers. One of the outcomes of AIT’s “Testregion” activities is an Android App with a variety of services for older adults presented on a tablet computer (current negotiations for this App with a major Austrian AAL solution provider and system integrator are ongoing). AIT-developed modules could be integrated in this App in the future (Windows/Sleeping Reminder would require the integration of HOMER).

Also high-level pattern recognition algorithms and know-how regarding safety services will be enhanced and exploited in further research activities with the goal to exploit them later on a license fee based strategy. AIT will work in strong collaboration with the Miraculous-Life business partners to anchor the AIT developed components and modules in final Miraculous-Life (exploitable) products and services.

Furthermore the Miraculous-Life outcomes will be used for extensive dissemination in scientific arenas and stakeholder communication. For these activities AIT can fall back on a well-composed network of stakeholders in Austria (e.g. AIT is a key player in the AAL Austria platform (www.aal.at) – the most prominent network of AAL stakeholders in Austria including research organizations, companies and user organizations).

4.4.2 UniGe

The exploitation strategy of UniGe for research projects is the future exploitation of the knowledge, and industrial propriety, not only by means of scientific publications, but also by means of the technology transfer to other companies or by commercializing the research results. UniGe having a long term expertise in carrying out research and development in the area of emotions and behaviour analysis and Human-Computer-Interaction, specifically avatar technologies, is interested in the exploitation of the avatar interface by forming together with the other project partners, who were involved in the development of the interface, a spin-off company to promote it in the market.

UniGe starts in January 2017 a new project (national funding) for the creation of a living lab for elderly in Geneva. A set of 20 to 30 apartments will be equipped with different technologies, and where we will be able to study for a 4-year period the evolution of the health conditions of elderly. A first project targets the degradation of prospective memory. Part of the results developed in Miraculous-Life will be used as the basis for new project.

UniGe will also disseminate the Miraculous-Life results through publications in journals and conferences and through several workshops, conferences and winter and summer schools

that they organize annually. Prof. Nadia Magnenat-Thalmann is editor-in-chief of two major scientific journals in the field of virtual agent technologies. One is “The Visual Computer: A journal dedicated to reporting on the state-of-the-art of research in the field of graphics, vision, imaging and virtual reality, including applications” and the other is “Computer Animation and Virtual Worlds: The first journal to address the global thematic of Virtual Worlds, Artificial Intelligence and Agent technology”.

4.4.3 UCY

Having a long term expertise in carrying out research and development in the area of collaborative environments and context-aware services in the eHealth and the Inclusion sectors, Miraculous-Life is seen as an excellent opportunity which will lead to new research directions especially through the development of the Home Daily ICT services. Such services fit well and will be integrated with other related research outcome the UCY has already managed to bring in the market. Miraculous-Life will also help UCY to consolidate and extend its links with industry giving opportunities for further valorisation of results.

Finally, UCY has experience in working together with the Cyprus IT sector in promoting research outcomes to the healthcare sector (public and private). The UCY is interested in the creation of similar channels for the promotion of the Miraculous-Life outcome. The UCY will play the role of further developing the Miraculous-Life outcome (especially the home-care services which it has designed and developed), but also as a consultant to both the IT industry and healthcare service providers regarding the Miraculous-Life concept, services, processes, technologies and overall solution.

The UCY will diffuse the project results via publications and presentations in the EU and international, industrial-driven but also academic journals, conferences, workshops, as well as in academic forums. Academic dissemination will also aim to bring technologies, developments and the research carried out in the project to the students via academic courses. Moreover, the NetRL website (<http://www.NetRL.cs.ucy.ac.cy>) will complement the project’s main website by posting public dissemination material like leaflets, publications, posters, flyers, reports and presentations.

4.4.4 ORBIS

ORBIS intends to expand the current range of services provided in their Hoogveld Elderly Living Village to include the Miraculous-Life system in order to provide support for its elderly users at regional or district level. Pending the successful operation of the pilot trials, ORBIS will adopt and use the project results in the elder apartment’s setup. The organization is interested to participate in a joined setup to be formed by the consortium partners for commercial exploitation of the overall integrated project outcome and its promotion in a wider market. For that ORBIS will work out appropriate strategies tackling a successful collaboration between ORBIS and the insurance companies the organization is already working with, so that the insurance companies recognize a financial benefit from the use of the system in the Hoogveld set-up. For example in the last years ORBIS, through its participation in other innovative research initiatives, has managed to achieve that a 3% (3.5 million Euro for 2013) of the yearly budget allocated from CZ, one of the biggest insurance companies in the Netherlands, to ORBIS to be used for carrying out research in the use of innovative technologies in elderly care in an effort to reduce care cost paid by CZ in the next years. CZ has already agreed that in case of a successful trial a financial plan will be put in

place of having the system being commercialized and taken up in the ORBIS homecare provision set-up. This can be a starting point of stimulating positively other insurances in other European countries in allocating budget for introducing the system in the elderly care process. ORBIS is the living lab for eHealth solutions in the Netherlands in cooperation with the healthcare insurance company CZ. Meaning after a successful project an implementation plan will be made including a financial plan for structural financing of the eHealth solutions. With this structural financing also other healthcare organisations have financial options to implement the eHealth solution. ORBIS will use the knowledge and expertise from this project together with other project partners in new projects for further development or enhancement of avatar based-systems to support patients and clients of ORBIS in the care and cure.

ORBIS disseminates and will continue disseminating the project and its results to the stakeholders and policy makers, organizing on-site visits, open days and press conferences, as well as presenting the project and the concept in different international exhibitions and events. ORBIS will also employ its experience on elderly care ethics and organization model, to continuously refine the final results of the project and contribute to their wide exploitation in Netherlands and in Europe.

4.4.5 Fh-IGD

As a non-profit research institution Fh-IGD is primarily interested in increasing knowledge of up-to-date solutions for the AAL market, as well as developing technologies to support the industry in this area. Since Fh-IGD is already heavily involved in German and EU founded AAL projects, it plans to make use of the Miraculous-Life results to continuously increase the benefit of AAL solutions. The results of Miraculous-Life will provide Fh-IGD crucial use-case implementations for interacting with the environment and make it even safer to use for elderly people. Fh-IGD is interested in exploiting, together with other interested partners, different technologies developed in Miraculous-Life, including the suite of home safety services. This will include multi-sensor technologies (e.g. depth cameras, RGB cameras) that consider elder behaviour recognition and environmental context analysis at home. Fh-IGD will use its strong research networks to disseminate project's results and will also disseminate project results through publications in journals and conferences and through several workshops, and conferences. Fh-IGD will lead the dissemination part of the project and thus plays a main role in making the Miraculous-Life concepts and results known internationally.

Fh-IGD will use the technologies developed within Miraculous-Life and offer solutions to existing contacts within the care technology and AAL domain. The plan is to mutually develop a product incorporating technologies that have been improved during Miraculous-Life. This process will start after the end of Miraculous-Life. Fh-IGD hopes to reach a development agreement with a care technology or AAL provider in 2018, so products can hit the market in 2020.

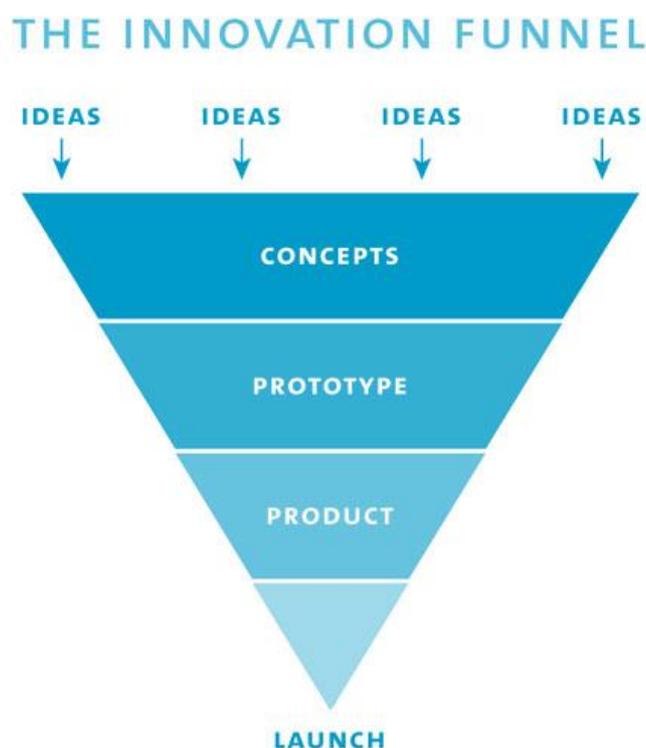
4.4.6 Noldus

Noldus will most likely focus on the exploitation of components such as the EmotionFusion tool, including FaceAnalysisServer. Furthermore, Noldus foresees that other technological components of the Miraculous-Life project may open the way to a range of new products.

Noldus has a track record of successful development of scientific inventions and software into commercially viable products.

Promising project results will be taken, together with other interested project's partners, along a mature and standardized route from prototype to commercial products. Noldus steps to get from research results to successful marketing are 'business as usual': (a) market research among potential buyers to determine functional requirements, acceptable price levels and potential partners, (b) desk research into existing products and competitive developments, (c) engineering, to proceed from the research prototypes towards a software application ready for release, including functional and usability testing and (d) marketing communication, sales, distribution and after-sales support.

Noldus has adopted a stage-gating process consisting of 5 stages: idea, concept, prototype, NBD product and R&D product. An NBD ('New Business Development') product is the final stage before a product is transferred to Noldus R&D for full development and commercialization. The EmotionFusionTool has reached its prototype stage within Miraculous-Life. The figure below illustrates the stage-gating process.



In order to transfer this prototype to the next level, a number of criteria has to be met. The main ones that will be addressed on a short term are:

1. Proven technical feasibility.
2. Positive feedback from project partners who represent the actual target group(s).
3. Positive feedback from at least one commercial prospect, preferably in the form of a contract showing commitment.

4. Positive ROI.

The first two criteria have been addressed in the final phase of Miraculous-Life. Once these have been met, we can address the third criterion, feedback from commercial prospects. The scenarios in 4.3 show it is possible to generate a positive ROI with the VSP, thus we can have confidence also the EmotionFusionTool can create a positive ROI. This assumption is also justified because this component is not only relevant for applications within the AAL domain. We are already in contact with potential OEM partners in other market segments that have shown interest in components for emotion analysis. Application examples:

- Several companies (a.o. in the Netherlands and US) offering systems for recruitment, assessment and training applications have shown interest in adding an EmotionFusion component.
- Manufacturers of customer support systems in Spain, France and the US have indicated they would like to add this functionality.

Furthermore, Noldus aims to promote results in the ICT for Brain, Body & Behaviour (i3B) Living Lab where innovative high-tech companies, knowledge institutions and end-users carry out collaborative research and development of measurement and analysis systems in the areas of brain, cognition, physiology and behaviour. Noldus is a co-founder of the lab (<http://www.i3b.org/>).

Noldus will disseminate the project results through demonstrations at conferences and tradeshows and through a broad variety of publications (press releases, web pages, product leaflets, white papers, and newsletters sent to more than 25.000 subscribers). Furthermore, the newly acquired scientific and technical knowledge will be disseminated via tutorials and training courses. Noldus is the initiator and organiser of the international Measuring Behaviour conferences (www.measuringbehavior.org). This interdisciplinary biennial event, which was held for the 10th time in 2016 with over 300 delegates, is entirely focused on methods, techniques and tools for the study of behaviour. Future editions of the conference will serve as a dissemination platform for Miraculous-Life project results. Already in the latest edition there were relevant sessions about topics related to the AAL domain, for example monitoring of home dwelling Alzheimer's patients and technology interventions in older adult populations.

4.4.7 CiTARD

CiTARD's interest is both in the exploitation of the project's overall outcome, together with the other partners of the consortium, and also in the exploitation of other technological components foreseeing in the project. CiTARD sees that the exploitation of the project outcome will create new market opportunities for the company and will strengthen its already existing collaboration with the ORBIS partner. At a national level CiTARD plans to exploit the project's overall outcome with elder care organizations the company is already working with, in improving their care processes through innovative technologies. Such organizations include the Melathron, which is the oldest established (1959) privately held care service organization, and also the Cyprus Social Services Center, the biggest public elderly care set-up.

Furthermore, CiTARD is foreseeing that other technological components of the Miraculous-Life project will open the way to a range of new products and also in enhancing existing products. Such products include the following:

- **Care Collaborative Network:** CiTARD is expecting to enhance and adapt its already developed Social Network SoCoNet to a care network specifically for elderly care that will provide an intelligent sharing system of alerts and information, to both the elderly and formal and informal carers, in the sense of instant communication and mobilization of all kinds of relevant daily activities support services. CiTARD also foresees that the enhanced network can be integrated in other care tele-monitoring systems the company provides for chronic ill people at home, like the DITIS system that is used by the Cyprus Cancer Organization improving thus the quality of needed care collaboration.
- **Avatar user interface component:** CiTARD will examine the possibility to enhance the already existing product MELCO that it provides for elderly care services, with the avatar based interface thus improving user acceptance of the product over the ageing process as the elderly will not need a touch screen to interact with the system.
- CiTARD is further interested in examining the potential of how technologies in the areas of behaviour analysis and emotional understanding can reinforce the usefulness and acceptability of ICT services provided by other systems, reinforcing thus their take up in the market.

CiTARD will disseminate the project and its results to related stakeholders (elderly care organizations, public sector service organizers, social security systems, and insurance companies) as well as presenting the project and the concept in different international exhibitions, events and conferences. Moreover, CiTARD as an active partner in the AgeingWell thematic network for the Market uptake of ICT for Ageing Well will promote the Miraculous-Life results to related network members.

4.4.8 Zoobe

Zoobe is interested to exploit the project's outcome in two ways. One is to exploit the overall system outcome with other partners in the project and the other one to exploit other technologies that will be developed in the frame of the project like implementing a persistent avatar user interface component that represents services in the area of Ambient Assisted Living. This technology will open the opportunity to initiate business co-operations in the growing market of care services for elderly persons. The project partners are highly prospective business partners in this respect for products to be developed after the runtime of the project. The developed technology will also enable a wide range of social interaction and messaging applications that are based on real-time talking avatar communication. Together with Zoobe's unique lip-sync speech animation technology, this will enable Zoobe to create market-leading communication products.

Furthermore, Zoobe will extend its character animation module to a complete expressive avatar system that is capable of displaying all basic emotions and that can be controlled by a reasoning component. Another main contribution from Zoobe to the project is the implementation of a module for emotion recognition from speech and its adaptation to the target group within the project. The combination of this expressive avatar system and the automatic emotion recognition from speech will be used for fundamental shift to new stage

of evolution of Zoobe's messaging service products. This development will evolve to a unique selling point for Zoobe and enhance significantly our market opportunities.

4.4.9 MRPS

MRPS aims to exploit the project's results by expanding the current range of home care services provided to elderly to include the Miraculous-Life system. The project fits well in its care provision program providing for interventions set to enhance the autonomy, dignity, sense of purpose, and identity of the elderly. Furthermore, MRPS together with other partners of the consortium is interested to work out a commercialization plan of the overall project outcome after the project.

MRPS will disseminate the project and its results to stakeholders and policy makers, organizing on-site visits, open days and press conferences, as well as presenting the project and the concept in different national exhibitions and events.

It has to be mentioned here that based on the knowledge acquired in the project, a start-up was created by persons working in MRPS, associated with ergotherapists, for the use of tablet technologies in the domain of handicapped (in the large sense) children.

5 Standardization strategy

Regarding the standardization strategy, two approaches are followed. On the one hand, get an overview and information about existing standards in the care and the ICT domain so that the project can use available standards in the organization and for the technical development of various components, especially regarding interoperability, scalability and connectivity of the system.

On the other hand, we monitored existing and ongoing work in standardization bodies and organisations with a special focus on interoperability, virtual characters, Human-Computer-Interaction based on emotions and behaviour analysis. Moreover, the project worked and partners are working towards standards to ensure that the research and development activities, but also the organizational activities, related to standards are aligned with the existing and future trends. This all having in mind the ultimate goal to enlarge the business and exploitation possibilities for the system or system components.

This chapter describes the existing standards relevant for the project, the standards used or which will be used by the partners and the future trends or next steps we see as a partner and as a consortium.

5.1 Existing standards

Paragraph 5.1.1 gives an overview of existing standards in the context of care and standardization which are relevant for the project and for the partners. An overview from more technical context is given in paragraph 5.1.2. What is the state of the art of ICT systems and which main platforms are available in the care domain and relevant for our project.

5.1.1 ICT standards in the care

Nictiz is the centre of expertise for standardization and eHealth in The Netherlands (www.nictiz.nl) and describes classification as a terminology system in which concepts and terms based on common features are classified. In other words: classifying involves organizing data by dividing them in categories based on matching and distinctive features. By using same concepts and terms a uniform language for care can be created. So classifications help to support the profession of nursing care in a uniform manner throughout the field that it covers. According to Nictiz Nanda / NIC / NOC, Omaha System, International Classification of Nursing Practice (ICNP) and the International Classification of Functioning, Disability and Health (ICF) are commonly used systems within the nursing and care. These classifications have their own perspective and background, it enables nurses and carers to classify and describe their care.

Nictiz and Vilans, a Dutch centre of expertise in the field of long-term care, are bundling their expertise and are collaborating on the theme eHealth. Vilans published a comparison of

classifications report in the social healthcare in September 2014²⁵. Following is a detailed comparison of classifications from the report:

Table 3: Detailed comparison of classification

Standard	ICF	NANDA	NIC
	International classification of Functioning, Disability and Health	North American Nursing Diagnoses Association	Nursing Interventions Classification
References	www.rivm.nl/who-fic	http://www.nanda.org/	http://www.nic.org/
Objective	Describing the human function plus the factors that thereafter be of influence.	Classifying the all accepted nurse diagnoses	Classifying the any treatment that a nurse carries out for the purpose of a patient.
Target audience	Originally the entire population, but later also youth. For example, ICF-CY specially developed for children.	Originally the entire population	Originally the entire population
Domains (highest level taxonomy)	Describing the functioning from three perspectives: 1.Man as organism (Functions anatomical Characteristics) 2.The human act (Activities) 3. Participation to the society (Participation) Beside: 4.List external factors	Classification NANDA has 13 domains, with which problems are described. Domains are: 1. Health 2. nutrition 3. excretion / Exchange 4. activities / tranquility 5. perception / cognition 6. self-perception 7. Roles / Relationships 8. Sexuality 9. Coping / stress tolerance 10. life principles 11. Safety / Protection 12. Well-being 13. Growth / development	Classification of NIC has seven domains which desired nurse interventions and actions will be described. The domains are as follows: 1.Elementair physiological features 2.Complex physiological features 3. Behaviour 4. Safety 5. Family and friends 6. healthcare System 7. Society
Answer Categories	Through 'qualifiers' (qualifiers). For example, the severity of the problems are indicated.		
Result	ICF is useful to describe the health of individuals in the different phases of the care process (diagnostics, intervention and evaluation)	The taxonomy helps the nurse to set diagnosis	The taxonomy helps the nurse an intervention find and choose and provides a possible structure for curriculum development. Making the digit Automation of the NIC possible.
substantiation / method of development	Publication Dutch ICF by WHO-FIC Collaborating Centre RIVM, April 2002	Nanda is an organization that development, establishment and revision of nurse diagnoses manages.	Since 1987 standardized terminology for nurse treatments (the NIC) is constructed, validated and implemented. Through an inductive approach are the interventions born, based on empirical

²⁵ Zoeken naar de gouden standard. Een vergelijking van classificaties voor de maatschappelijke gezondheidszorg; Jennie Mast, Vilans, Utrecht, September 2014; [http://www.vilans.nl/docs/vilans/publicaties/zoeken naar de gouden standaard.pdf](http://www.vilans.nl/docs/vilans/publicaties/zoeken%20naar%20de%20gouden%20standaard.pdf)

			research. Subsequently, there was an ordering structure required.
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Table 4: Detailed comparison of classification continued

Standard	NOC	Omaha system	RAI
	Nursing Outcomes Classification		Resident Assessment Instrument
References	http://www.nursing.uiowa.edu/cncce/nursing-outcomes-classification-overview	http://www.omahasystem.org/ http://www.omahasystem.nl	http://www.interrai.org
Objective	Classifying the nurse care outcomes.	Describing Health and care from a holistic perspective.	Quality of care and Improving life the individual, by a holistic view, problem identification and care needs of the individual make transparent.
Target audience	Originally the entire population	Originally the entire population	Originally nursing home residents , from early 2000 entire population
Domains (highest level taxonomy)	Classification NOC has seven domains which results and indicators neutral terms will be described. The domains are as follows: 1.Functional health 2.Physiological health 3.Psychosocial health 4. Health knowledge and behaviour 5. Health perception 6. Health family and family 7. Societal health	OMAHA consists of three parts / cohesive components: 1.Probleem classification 2.Interventie classification 3.Resulting scales. OMAHA distinguishes problems on four different domains: 1.Phyysiological domain 2.Health related behavioural domain 3.Environmental domain 4.Psycho social domain The interventions have three levels: 1.Generieke categories, such as treatment, case management and monitoring.	RAI consists of three basic components: 1.Review instrument, by standardized and scientific validated questionnaire. 2. Make Scales: measurement of progress the individual using amount of care and welfare aspects. 3. Issue alerts: a series of protocols which the nurse assists in the compiling "best practice" care plans for frequent problems elderly. 4. Resource Utilization Groups: classification system based on assessment to care needs and intensity and use from sources predict the level of an individual resident.
Answer Categories	5-point Likert scale with at the one terminus a negative state and at the other a positive state.	The shells consist of three 5-point Likert scales. The three scales are: 1. Knowledge, what knows the customer 2. Behaviour, what does the customer 3.Status, number and severity of issues	Different per question, ranging from Yes / No To e.g. a gradation in which extent someone (in) dependence in terms of ADL has.
Result	The NOC presents nurses capable changes in the state of the patient after the interventions assess and progress of the patient to follow.	With help from rating scales the results can of interventions are determined.	Determination of the care needs, problem areas progress / decline, quality indicators and care categorization of the individual. Offering direct healthcare-related

			support nurses and by carers their attention to establish possible not before noticed problems of the residents.
substantiation / method of development	The NOC is also at the University of Iowa developed with cooperation of many Members of the NIC team.	Developed in the USA based on scientific Research and is translated into Dutch. Is now in more than 20 countries used.	Developed in the US. In the US introduced in all institutions where elderly nursed and cared for. At this time RAI in more than 35 countries used, in which is mandatory in some countries including Finland, Iceland and Belgium.

5.1.2 ICT standard platforms

This paragraph lists a number of known platform or framework tools relevant for the project or specifically for a partner.

AllJoyn Framework

AllJoyn is an open source software framework that makes it easy for devices and apps to discover and communicate with each other. Developers can write applications for interoperability regardless of transport layer, manufacturer, and without the need for internet access. The software has been and will continue to be openly available for developers to download, and runs on popular platforms such as Linux and Linux-based Android, iOS, and Windows, including many other lightweight real-time operating systems.

The AllJoyn Framework is part of AllSeen Alliance. AllSeen Alliance is a cross-industry consortium dedicated to enabling the interoperability of billions of devices, services and apps that comprise the Internet of Things (www.allseenalliance.org).

FiWare

The FIWARE platform provides a rather simple yet powerful set of APIs (Application Programming Interfaces) that ease the development of Smart Applications in multiple vertical sectors. The specifications of these APIs public and royalty-free. Besides, an open source reference implementation of each of the FIWARE components is publicly available so that multiple FIWARE providers can emerge faster in the market with a low-cost proposition.

The FIWARE Community is an independent open community whose members are committed to materialise the FIWARE mission, that is: “to build an open sustainable ecosystem around public, royalty-free and implementation-driven software platform standards that will ease the development of new Smart Applications in multiple sectors” (<https://www.fiware.org>).

Continua

Continua is an international not-for-profit industry group and the leading organization convening global technology industry standards to develop end-to-end, plug-and-play connectivity for personal connected health. Continua's Design Guidelines based on global

industry standards and test tools enable more efficient, standardized development and create new market opportunities for interoperable personal health devices and services used to collect and relay vital health information and education (<http://www.continuaalliance.org>).

OneM2M

The purpose and goal of oneM2M is to develop technical specifications which address the need for a common M2M Service Layer (Machine to Machine) that can be readily embedded within various hardware and software, and relied upon to connect the myriad of devices in the field with M2M application servers worldwide. A critical objective of oneM2M is to attract and actively involve organizations from M2M-related business domains such as: telematics and intelligent transportation, healthcare, utilities, industrial automation, smart homes, etc. (<http://www.onem2m.org/>).

UniversAAL

UniversAAL aims to produce an open platform that provides a standardized approach making it technically feasible and economically viable to develop AAL solutions. The platform will be produced by a mixture of new development and consolidation of state-of-the art results from existing initiatives.

The main objective of the project is to make it technically feasible and economically viable to conceive, design and deploy innovative new AAL services. To do this, we will:

- Produce a platform providing the necessary technical support, and acting as an open, common basis for both developers and end-users;
- Carry out support activities promoting widespread acceptance and adoption of the platform. These activities form an integral part of the project and will start at an early stage.

It should be as simple for users to download and setup AAL services as it is to download and install software applications on a modern operating system. UniversAAL will establish a store providing plug-and-play AAL applications and services that support multiple execution platforms and can be deployed to various devices and users. Finally the allocation of local human resources is also supported in the store (<http://universaal.org>).

Crystal

CRYSTAL as an ARTEMIS Innovation Pilot Project (AIPP) takes up research results of previous projects in the field of Reference Technology Platform (RTP) and Interoperability Specification (IOS) (e.g. CESAR, MBAT ...) and enhances and matures them with the clear aim of industrialisation take-up. RTP and IOS will allow loosely coupled tools to share and interlink their data based on standardized and open Web technologies that enable common interoperability among various life cycle domains. This reduces the complexity of the entire integration process significantly.

CRYSTAL is strongly industry-oriented and will provide ready-to-use integrated tool chains having a mature technology-readiness-level (up to TRL 7). Following the ARTEMIS mission to strengthen the European market for Embedded Systems, CRYSTAL fosters cross-domain reusability (Aerospace, Automotive, Health and Rail) and pursuits driving forward the Interoperability Specification towards standardization (<http://www.crystal-artemis.eu>).

5.2 Activities for standardization by the partners

5.2.1 MRPS

In Switzerland, several companies are selling specific management software solutions designed for nursing homes and health care organizations. Some of those solutions became a reference in this field and could be considered as being Swiss-French standards: Sadies²⁶ and Opale²⁷. Other minor solutions were also identified: id.Viva²⁸, saintet erp²⁹ and Hermès³⁰. We strongly think that in order to bring successfully the Miraculous-Life solution in the Swiss-French market, business partners should ensure an efficient communication between the Miraculous-Life back-end and those existing management software solutions.

1. Sadies

Sadies is a management software tool designed for nursing homes, developed from standard tools, running under Windows environments. This solution is largely used in Swiss-French seniors organization. In fact, this system is implemented in eighty-four health care organizations in the Canton Vaud and forty-five organizations in the Canton of Geneva, including MRPS (see Figure 1).

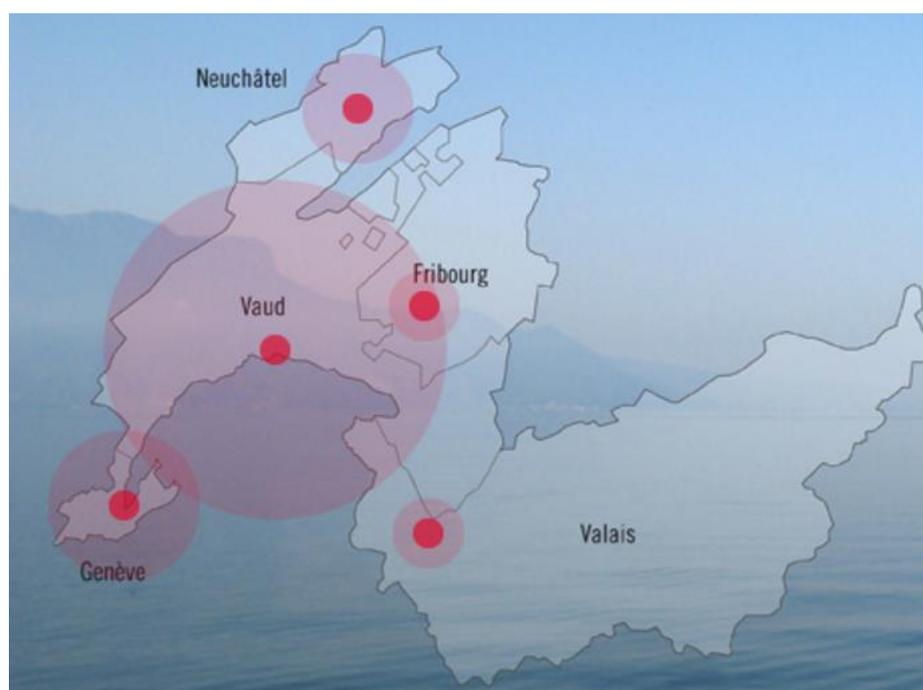


Figure 1. Representation of health care organizations using the Sadies solution in the Swiss-French part of Switzerland.

²⁶ <http://www.sadies.ch/>

²⁷ <http://www.opale.ch/>

²⁸ http://www.groupeid.ch/cms/.idviva-solutions_EMS

²⁹ <http://www.sai-informatique.ch/html/fr/progSocial.php>

³⁰ <http://www.bellerive.ch/dernieres-news/44-hermes-logiciel-de-gestion-pour-les-ems>

The suite offers the following modules:

1. Digital files of the residents (DIR): this module become a reference in the French-speaking area of Switzerland and it's also used by nursing schools for training of their scholars. In MRPS, this module is largely used by cares, nurses and members of the service to the residents' team in order to manage client files.
2. Billing, accounting, wages: allows to automate the main elements of management including invoicing of care, invoicing of accommodation, cantonal subsidies, accounts receivable, wages, financial and analytical accounting.
3. Complementary modules: cash desk, cafeteria, creditor, addresses, stocks, auxiliary means, planning
4. Document and quality management: allows to organize, find, control, and securely share all documents with all relevant persons increasing the efficacy of workers.

2. Opale

Opale is a management software targeting Swiss healthcare organizations. The environment Opale offers a comprehensive and efficient administrative management system for residents living in a nursing home and support the follow-up of the daily delivered cares. This solution covers all the administrative needs related to the residents; including appointment management, data archiving, service entry, electronic invoicing, statistics and cost analysis. Note that this system was implemented in MRPS before 2015, and it was progressively replaced by the Sadies solution during 2015/2016. The Opale suite offers the following modules:

1. Finance: including financial accounting, cost accounting, supplier management, management of personnel and salaries, various invoicing
2. Logistics: inventory management, investment property management
3. Hospitality management: patient management, physician management, management of guarantors, hospital billing, XML invoicing, statistics, management of accounts receivable.
4. Statistics: data warehouse, cockpit, miscellaneous statistics
5. System: utilities managing the Opale work environment

In order to bring the Miraculous-Life solution (or any other AAL solution) efficiently in the Swiss-French market, designers should ensure an efficient communication between the Miraculous-Life back-end and the modules "Digital files of the residents" (Sadies) and Hospitality management (Opale).

5.2.2 AIT

Connectivity with other systems / system-system and system interaction

In the area of connectivity with other systems / system-system and system interaction AIT has performed Miraculous-Life system integration partly on existing middleware technologies and platforms. One of the components responsible for sensor integration (windows/bed sensors) used is the AIT HOME Event Recognition system (HOMER). HOMER has its origins in UniversAAL mentioned above and is as well linked to AALOA³¹.

³¹ www.aalooa.org

Description of HOMER

The HOME Event Recognition System (HOMER) integrates the local (off-the-shelf) sensors and performs pre-processing. This open source platform is based on an Apache Karaf OSGi framework and encapsulates its functionalities in terms of OSGi bundles, which enables modularity. The bundles are executed on the Java Runtime Environment (JRE), which can be installed on various operating systems, what offers hardware independency. The usage of an OSGi framework provides remote maintenance and individual adaptability of the system. The components, coming in the form of bundles for deployment, can be remotely installed, started, stopped, updated and uninstalled without requiring a reboot of the system. Thus, the framework is flexible in terms of expanding its functionality and updating single modules during runtime. The interactions and dependencies between bundles are handled by the framework itself. It manages searching and binding of required services, which are exposed functionalities within OSGi bundles, even when the service is activated at later time. Fine grained configuration options allow detailed access to functionalities in each OSGi bundle. Along with OSGi several supporting technologies, like Apache Maven³² and Eclipse Gemini Blueprint³³ (formerly known as Spring Dynamic Modules³⁴, which was migrated to the Eclipse foundation) are used. Standards for medical device communication and home automation networks are integrated to enable communication to appropriate devices. All of these technologies are used to realize important aspects for an AAL service platform, namely security, modularity, extendibility and interoperability.

Furthermore HOMER makes use of several standards, namely:

- Independent Living Activity Hub specialization ISO/IEEE 11073-10471.
- ISO/IEC 14543-3: KNX is a standardized OSI-based network communications protocol for intelligent buildings³⁵.

Applied to all connected sensor technologies is a mapping within HOMER components to one central, standardized data model. This is essential for further data processing in terms of event recognition and reasoning.

HOMER Architecture and Standards/Technologies

HOMER is developed in Java and follows the OSGi (Open Services Gateway initiative) specification [1]. Also HOMER is based on Apache Karaf. The advantage of OSGi is the modularization of the whole application into a number of smaller bundles, which can provide services to each other. You actually can start/stop/update/exchange modules during runtime.

³² <http://maven.apache.org/>

³³ <http://www.eclipse.org/gemini/blueprint/>

³⁴ <http://docs.spring.io/spring-osgi/docs/current/reference/html/>

³⁵ [http://en.wikipedia.org/wiki/KNX_\(standard\)](http://en.wikipedia.org/wiki/KNX_(standard))

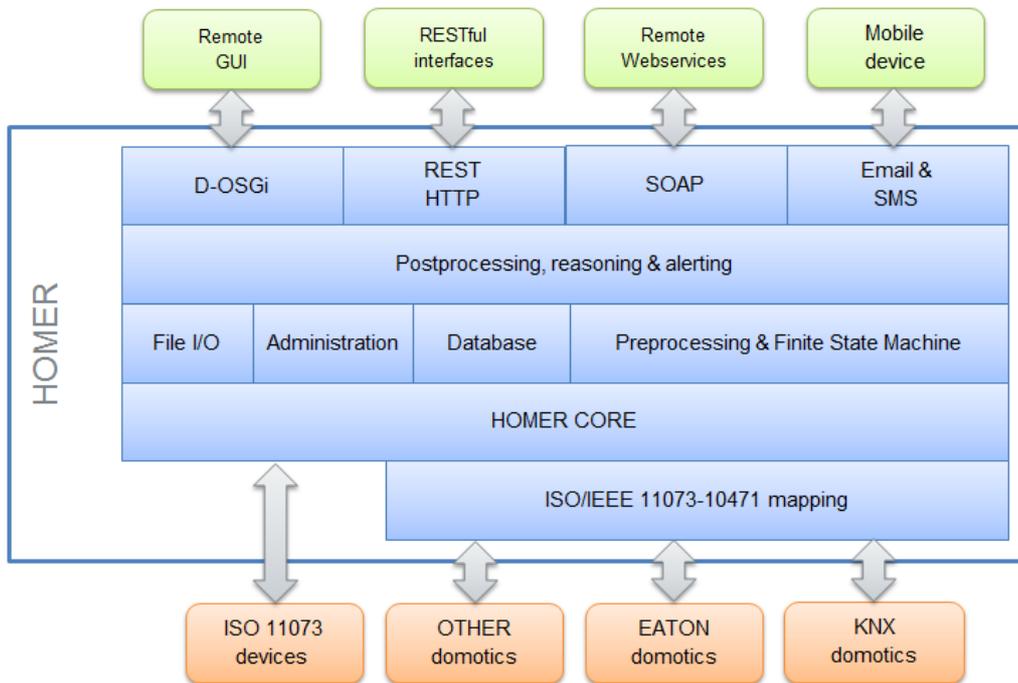


Figure 2: HOMER system architecture

HOMER Core is an Open Source project, licensed under the GNU LESSER GENERAL PUBLIC LICENSE V2.1. The Homer OSGi framework can only be used in compliance with the License. A copy of the license can be obtained at <http://www.gnu.org/licenses/lgpl-2.1.txt>. Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an “AS IS” BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

AIT is using and will use HOMER in other national and European R&D activities, field installations as well as for for exploitation.

Human-System Interaction

In order to provide a user interface which can be used on a wide variety of devices, great emphasis was put on using technology based on existing protocols, specifications and web standards from the World Wide Web Consortium (W3C)³⁶, WHATWG³⁷, The Internet Engineering Task Force (IETF®)³⁸ as well as Standards from Ecma International®³⁹. More specifically, the following protocols, specifications and standards were used:

- W3C
 - HTML5: <https://www.w3.org/TR/html5/>
Used for displaying data as well as playing multimedia data (video/audio)

³⁶ <https://www.w3.org/Consortium/>

³⁷ <https://wiki.whatwg.org/wiki/FAQ>

³⁸ <https://ietf.org/>

³⁹ <https://www.ecma-international.org/>

- directly in a browser without the need for additional plug-ins or 3rd party programs.
- CSS: <https://www.w3.org/TR/CSS/>
Used to design the user interface.
 - webRTC: <https://www.w3.org/TR/webrtc/>
Used to establish VoIP (voice over IP) connection directly in the browser without the need for additional plug-ins or 3rd party programs.
 - Web Storage: <https://www.w3.org/TR/webstorage/>
Used to locally store the deviceid of the user interface.
- IETF®
 - WebSocket Protocol: <https://tools.ietf.org/html/rfc6455>
Used for enabling a full-duplex communication channel over a single TCP connection.
 - SIP: <https://www.ietf.org/rfc/rfc3261.txt>
Used for VoIP functionality.
 - WHATWG
 - WebSocket Interface:
<https://html.spec.whatwg.org/multipage/comms.html#network>
Interface specification of the WebSocket protocol in web applications
 - Ecma International®
 - ECMAScript: ISO/IEC 16262 (<http://www.ecma-international.org/publications/standards/Ecma-262.htm>)
Used for adding dynamic interaction capabilities to otherwise static HTML based UIs.
 - JSON:
 - ISO/IEC DIS 21778 (<http://www.ecma-international.org/publications/standards/Ecma-404.htm>)
Data exchange format between different components of the Miraculous-Life system.

5.2.3 Citard

A set of services for active ageing have been preliminarily identified and studied in the project. An effort has been further undertaken in selecting and publishing in an international paper⁴⁰ a set of services that can contribute to the standardization of services required in the ICT area of Active Ageing and Independent Living, thus reducing time and resources from companies and SIGs needed to be allocated for identifying, from scratch, the services that will be supported by their products or policies. Citard proceeded to further

⁴⁰ C. Christophorou, D. Georgiades, P. Andreou, S. Kleanthous, D. M. Cereghetti, J. Meijers, E. Christodoulou, G. Samaras, "ICT Systems and Services: Identification and Assessment of a Package of ICT Services for Ageing Well", XIV Mediterranean Conference on Medical and Biological Engineering and Computing (MEDICON 2016), March 31st - April 2nd 2016, Paphos, Cyprus.

enhance the Co-Net, to a commercialized version, named Citard Active, making use of a number identified set of services related to the socialization aspect enhancing thus its products in the Active Ageing and Independent Living area. Citard Active enables further to Co-Net the creation of communities in which the older adults can join and the use of the system in daily care centers. Means were older adults were using the system only in care centers, Citard Active is enabling older adults to use it daily care facilities.

Citard next plans is to enhance Citard Active to the Home Care sector. This will be achieved by enabling elderly to manage their own activities and communities using dedicated interfaces specifically design for the elderly. In a home care environment the care centers will have a restricted but valuable role on providing them services to increase their quality of their daily life.

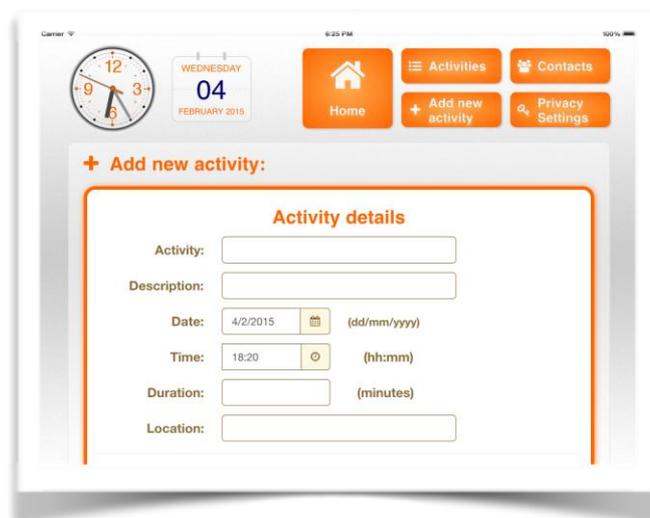
Citard Active is a whole solution for care centers and the elderly. This means it takes several components and produces a coherent and stable technological solution to support the elderly. Co-Net is a component developed in the project which is an expansion of another component developed in a previous project, Co-Living. The Co-Net component is integrated in Miraculous-Life by making use of the AAL middleware HOMER, used in the project, and Citard Active will take up on this components added functionality and bring it to the elderly using Citard Active.

In more detail, Citard Active's current functionalities are below:

- **Enabling elderly population to be socially and physically active for a longer period.** By using the Citard Active app the elderly can also enlarge and maintain their social network. Moreover, it provides them the option of sharing agendas, with family or friends, to see in which activities they will participate or have participated in the past. Additionally, the app encourages the elderly to take part in the activities taking into consideration their ageing-related cognitive and physical behavior changes.

- **Communication between Elderly.** Elderly people can easily contact their friends by inviting them to an activity. In this case, they can simply send an invitation and get an answer. Moreover, the activity or meeting can be easily created also by the elderly.

- **Elderly management of activities.** Elderly can create and see all possible activities, register and unregister from them. After registering, the elder receives a reminder before the start of that activity. This has proved to be very useful within care centers. Not only do participants now remember their activity but they are also reminded to bring certain accessories that are necessary for the activity, such as their glasses or a coat.



- **Behavior analysis.** The system registers the normal behavioral pattern of the elderly and detects when changes occur and the person is more passive than usual. In this case, the app stimulates the user to participate in activities. If the elder does not respond, an alert is provided to the caregiver. This is an important feature as passivity can indicate psychological and physical problems.

- Provide means to:

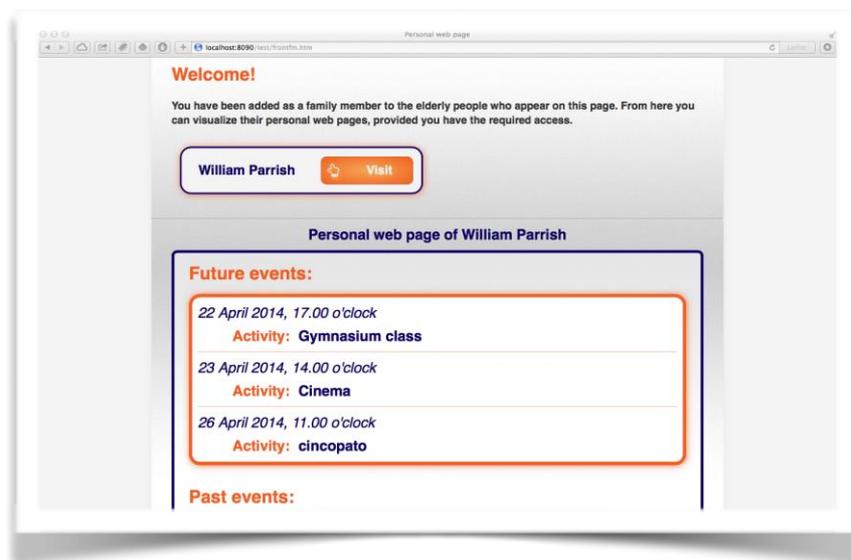
- Register for various activities.
- Remember when an activity starts.
- Remember to bring certain accessories that are necessary for the activity.
- Expand their social network with family members and friends.
- Plan and create activities by themselves.
- See the weather forecast.
- Stimulate the participation in activities -- achieved by the behavioral analysis.
- Be tracked in case they need help reaching an activity's location.

- **Location Tracking.** The Citard Active app also offers the possibility to know the whereabouts of the elderly. The caregiver can assess, by means of location tracking, whether the elder is on his way to the activity or has already arrived.

- **Caregivers and administrators.** Caregivers and administrators have dedicated pages to control the system. Caregivers can add activities and manage the elderly in the system. Administrators can control the different settings and preferences of the system.

- **Families.** Families are also involved. After being given permission from their relative, family members can also log in to Citard Active and have access to their relative's personal page and agenda. On this page, the activities the elderly has participated and will participate are displayed. This page is especially handy for relatives that live far from the elderly, as activities are forgotten or not considered important enough to mention during a phone conversation. Relatives can now ask for specific activities, which contribute to

maintain and enlarge the elderly social network. Moreover, the relatives get an overview of which activities are organized in the near future and can stimulate the elderly to participate.



In order to match the Miraculous-Life end-user requirements and services Citard has developed the Co-Net tool with the following enhancements:

The enhancement of the Co-Net (Collaboration Network) includes:

- Building a virtual care team around the elderly;
- Set of responsibilities and access rights;
- Intelligent and secure sharing system of alerts and information;
- Instant communication and mobilization between elderly and formal/informal carers;
- Improving the seamless communication of data among all involved stakeholders.

These enhancements will link-up to the core services and product solutions Citard offers for the elderly market.

Understanding the project requirements and finding ways towards their standardization strengthens Citard main aim is to achieve a leading role in the independent living products and services market. That in turn ultimately allows the creation of new business areas and addresses the significant society and economy challenges EU wide regarding the elderly lives and the related surroundings.

5.2.4 Zoobe

Zoobe GmbH developed the Zoobe app which is able to operate on all mobile operating systems. Through the development of the Zoobe app, Zoobe software is able to offer animated 3D messaging content for messaging services, enabling entertainment-based

communication but also facilitating voice-based animations which recognise emotional intent. Components of the Zoobe software have been developed and incorporated into the aforementioned respective communication software, applications and systems.

The main goal for Zoobe GmbH was to provide for a scalable, reliable and interactive solution which facilitates communication by the project's users. The Zoobe app and integrations leading thereto can be specifically targeted at elderly users, while through the current reach and increasing usage of the Zoobe app, we expect ongoing coverage in the targeted user base and regions. For more information on the Zoobe software: <http://www.zoobe.com/>

5.2.5 Fraunhofer IGD

Fraunhofer IGD is pursuing a multitude of activities in standardization of components and methods used in the scope of the domain of AAL. Notable activities include

- universAAL IoT

universAAL IoT is the newest iteration of the universAAL platform that was described in an earlier section. universAAL already contributes to various standards that play a big role in the AAL domain. The platform is actively promoted by the EC and will be part of several upcoming projects, including the large scale pilot ACTIVAGE.

- IEC SyC AAL

The IEC system committee "Active Assisted Living" aims to create a vision of Active Assisted Living that takes account of the evolution of the market and fosters standardisation, which enables usability and accessibility of AAL systems and services, enables cross-vendor interoperability of AAL systems, services, products and components, addresses systems level aspects such as safety, security and privacy, and finally communicates the work of the SyC appropriately to foster a strong community of stakeholders.

- AIOTI

The Alliance for Internet of Things innovation was initiated by the European Commission in 2015. The mission is to contribute to a dynamic European IoT ecosystem. Fraunhofer is active in most working groups of the alliance.

5.2.6 Noldus

Noldus developed the software library N-Linx. N-Linx is a software library for communication between applications and systems, developed to meet the need for standard communication between system components. It has been developed by Noldus InnovationWorks, amongst others within research projects such as PRONTO (FP7), Guarantee (ITEA2), E-MOSION (AAL). During this project we developed the first commercial version 1.0. The main driver to develop N-Linx was to have a flexible and scalable platform for communication between systems written in different programming languages and running on remote machines and to have a standardization in terms of how and what to communicate. At this moment a series of Noldus products including Viso and The Observer XT, are compatible with N-Linx and more will follow. For more information: <http://www.noldus.com/innovationworks/products/nlinx> .

Further more we identified some other possible intersystem frameworks. A promising one seems to be the SWAN framework (<http://www.cs.vu.nl/SWAN/>). An open-source sensing framework for smart phones meant for application developers to easily build context-based apps in the field of health care, transportation.

5.2.7 UCY

During the lifetime of the project, various services targeted for active ageing were identified, designed and implemented. These services were designed focused on the maximum expandability and adaptivity to other Independent Living areas, providing a basic tool for future projects as a starting point for further development in other sectors of the active ageing area. These services were categorized and published by the consortium ^{Error! Bookmark not defined.}⁴¹ thus contributing to the standardisation of services required in this ICT area of Active Ageing and Independent Living.

Furthermore, the database support of these services was develop in a modular way in order to support maximum customization towards a standardisation of the components used in the project, providing a good starting point for future endeavours such as in the case of GrowMeUp project (H2020-PHC-2014).

5.2.8 Session operability AAL forum 2015 Ghent

A number of participants from several partners of the Miraculous-Life project participated in the session Standards and Operability in the field of AAL at the AAL forum in Ghent, Sep 2015. See also <http://www.aal-europe.eu/support-to-projects/interoperability-standards/>. A final deliverable report can be found on: http://www.aal-europe.eu/wp-content/uploads/2015/02/AAL_JP_Interop_D5_Final_Report1.pdf

5.3 Future trends and next steps

One can observe that many classifications, ICT systems and platforms are available to support interoperability but care organisations determine by themselves which classification they will use. Most systems are generic purpose and have a holistic view to the patient or caregiver. Differences can be seen in the extension options of classifications and in practical applicability. Classifications for the care has to bring care further, associations between classifications which are already available are supporting this furthermore. ICT will be necessary to make a next step.

⁴¹ C. Christophorou, S. Kleanthous, D. Georgiadis, D. M. Cereghetti, P. Andreou, C. Wings, E. Christodoulou, G. Samaras, "ICT Services for Active Ageing and Independent Living: Identification and Assessment", IET Journals, Healthcare Technology Letters, 1st May 2016.

In the Netherlands there is agreement (Vilans, July 2014) between twenty care organisations and insurance companies⁴² for an exploration of the use of the Omaha system⁴³ in the local care.

More specific for this project we can state that we make heavily use of existing standards and partners define new frameworks which can change or merge with existing standards, steps are made during the project and activities and plans are defined by the partners for after the project to enlarge the business opportunities of the Miraculous Life system and her components.

⁴²<http://www.zorgvisie.nl/F2R/?returnurl=%2fKwaliteit%2fNieuws%2f2014%2f10%2fOmaha-System-wint-snel-aan-populariteit-1615414W%2f>

⁴³ The Omaha System: a systematic review of the recent literature, Maxim Topaz, Nadya Golfenshtein, and Kathryn H Bowles, J Am Med Inform Assoc. 2014 Jan; 21(1): 163–170.

Appendix A Scan of AAL Solutions

Goal of this section is to give an overview of different technologies which all have one thing in common: prolonging independent living of elderly people. Since the number of developments in this area is huge, this is not an exhaustive overview, main goal is to give an idea of the different types of solutions, based on a scan with a focus on Europe.

Goal	Technology/Solution	Examples	Status	Link with Noldus technology (<i>EmotionFusion</i>)
Monitoring significant events for emergency purposes, e.g. fall detection	Passive Infrared motion sensor technology (PIR)	Ref. (1)		
	Body-worn sensors	Ref. (1)		
		<i>Centric</i> (NL) offers a system based on a smartphone app, linked to a portal for caregivers. Mainly for fall and wandering detection.	Commercially available	
		<i>Avics</i> (NL) is a system integrator focusing on health care solutions. One of their solutions is based on WiFi and movement detection sensors, wrist sensors, door sensors, etc.	Commercially available	
		<i>Dutch Domotics/Sensara</i> (NL): sensors for fall and wandering detection. More info http://dutchdomotics.nl/	Commercially available	
Video monitoring		Ref. (1)		

		<i>Hogeschool van Amsterdam</i> : tool for fall detection using cameras.		
Indoor tracking/navigation and detection of daily activity for non-emergency purposes	Passive Infrared motion sensor technology (PIR) for: <ul style="list-style-type: none"> ▪ detection of activity ▪ detection of activity to identify changes in health status ▪ detection of gait velocity ▪ localization ▪ detection of significant events (e.g. shutting off bath water, using meals) 	(1) lists 61 articles which describe the use of PIR motion sensors (advantage: non- invasive)		
		<i>TeleAlarm</i> (used to be the health care division of Bosch). Now testing tools for pattern detection that can detect changing patterns of elderly.	Commercially available. Business model: start fee+ subscription	
		Sensara: sensor based system for monitoring daily activities and patterns, including app for caregivers/relatives: http://mysensara.com/inside-out/?lang=en	Commercially available	
Body-worn sensors for detecting: <ul style="list-style-type: none"> ▪ postural transitions ▪ walk detection ▪ detection of significant events 	(1) lists 26 articles which describe the use of body-worn sensors to detect activity and posture.			

	<ul style="list-style-type: none"> ▪ ADL (Activities of Daily Living) ▪ Differentiate between ADL and fall events 			
	<p>Video monitoring for detecting:</p> <ul style="list-style-type: none"> ▪ Postural transitions (e.g. walking, bending, sitting) ▪ Posture recognition ▪ Activity ▪ Significant events 	<p>(1) lists 8 articles which describe the use of video monitoring</p>		
	<p>Pressure sensing technology used for detecting:</p> <ul style="list-style-type: none"> ▪ Transfers (sit-to stand and stand-to-sit) ▪ Activity 	<p>(1) lists 3 articles which describe the use of pressure sensing technology</p>		
	<p>Sound recognition technology for detecting:</p> <ul style="list-style-type: none"> ▪ Activity ▪ Significant events 	<p>(1) lists 2 articles which describe the use of sound recognition technology</p>		
	<p>Other technologies</p>	<p><i>Mieloo & Alexander</i> (NL): system integrator, have developed a system within a FP7 project for movement and location detection. Inside based on RFID, outside on GPS. When using more sensors inside, accuracy is up to 50 cm. They want to offer this via care providers, but potentially also directly to end users.</p>		

	Combinations of technology (PIR+video or PIR+body-worn sensors)			
Tools for supporting daily activities	Solutions for interacting and supporting people with need for assistance remotely	<i>FlevoMind / Connected Vitality Network</i> , collaboration between CMO Flevoland (Centrum Maatschappelijke Ontwikkeling), GGZ and YOOOM. The network is aimed at remote support of elderly and/or psychiatric patients who have returned to their own home.		
		<i>Mobiserv</i> by Smart Homes: prototype of a Smart Home environment, consisting of companion robot, smart clothes and a smart home environment for assistance and monitoring patterns. In prototype phase http://www.smart-homes.nl/Innoveren/Sociale-Robots/Mobiserv.aspx?lang=en-US		
		<i>Giraff</i> (http://www.giraff.org/?lang=en), mainly for communication. Victoryahome is using a Giraff (costs €6-7k). Functions: alarm (and follow up), virtual visits and visit requests, medicine reminders, movement check, fall detection, panic button. Advantage compared to Skype (for example): the robot moves through the house, like a real visitor he can come to you, plus no knowledge required. More info: www.victoryahome.eu . Together with	Commercially available (subscription €300/month)	OEM: EmotionFusion functionality could be a component

	<p>the UvA and Imperial College (Maja Pantic) they are working on a facial expression analysis functionality (http://teresaproject.eu/)</p>		
	<p><i>Sonamba</i> (http://sonamba.com/), offers ADL monitoring (by monitoring movement and sounds), medicin reminders, panic button, socials communication</p>	<p>Commercially available</p>	
	<p><i>PAUL</i> (http://www.meinpaul.de/), system for communication that can be extended with cameras and sensors, for example to check whether doors and windows are closed.</p>	<p>Commercially available, offered by CIDEK in Germany (price starts from €1999).</p>	
	<p><i>Vlinder</i> (http://www.mijnvlinder.nl/); main functions:</p> <ul style="list-style-type: none"> ▪ Wandering detection ▪ Good morning alarm (check activity) ▪ Communication with caregivers (speech) ▪ Medication reminders ▪ Alarm function <p>Localisation based on GPS, GSM and WiFi, followers can see where the elderly person is using an app.</p> <p>Target group: people in early stage of dementia</p>	<p>Commercially available, €25/month</p>	

	<p><i>JAAPIE</i> (http://jaapie.nl/), supports daily activities:</p> <ul style="list-style-type: none"> ▪ Agenda and medication reminders ▪ Communication with caregivers or relatives ▪ Alarm functions ▪ Remote measurement of blood pressure, weight, glucose, heart beat ▪ Meal service ▪ Arrange transport ▪ Fall and wandering detection 	<p>Available from MIZO Woonondersteuning B.V.</p>	
	<p><i>MEMOmessenger</i> (http://abilia.com/en/product/memomessenger?product_category=34)</p> <ul style="list-style-type: none"> ▪ Tells the time, tells the year, the month, the date and whether it is night or day ▪ Relays messages and reminders discretely via earphones. 	<p>Commercially available</p>	
	<p><i>Virtask</i>: virtual assistant (avatar) for agenda control (reminders of meetings and medicine), control of home automation, video calling with caregivers or relatives, personalized news (http://www.virtask.nl/wordpress/anne-thuiszorg, Dutch only, but the tool is</p>	<p>Commercially available. Business model: for private users pay per use, or as part of a care</p>	<p>OEM: EmotionFusion functionality could be a component</p>

	also available in English and Portuguese). This tool was also used in the AAL project DALIA (http://www.dalia-aal.eu/)	agreement (€60-80 pm)	
	<i>Viedome</i> : digital platform for caregivers and elderly for example for communication, wander detection, security, etc. (www.viedome.tv).	Commercially available	OEM: EmotionFusion functionality could be a component
	<i>Quli</i> : platform connecting apps, care providers, relatives, friends with elderly. Mainly for help with daily activities, and medical information, including video calling (https://www.quli.nl/ , Dutch only)	Commercially available	OEM: EmotionFusion functionality could be a component
	<i>Relaxed Care</i> : communication tool for communication between assisted person and informal caregiver. Uses a cube and basic sensors to indicated activity level, social interaction and daily life routines. It enables both sides to send simple messages (for example asking for help, requesting a call) (http://www.relaxedcare.eu/en/).	Looking for funding; business model will be subscription based	
	<i>EDLAH</i> : developed within the AAL programme. Tablet based tool with 4 functions, based around: <i>Health& nutrition</i> <i>Communication&social network</i> <i>Object localisation</i>	Commercial release being prepared.	

	<p><i>Medication</i></p> <p>(http://www.aal-europe.eu/projects/edlah/). Product has been launched under the name iCare24/7 (http://www.icare247.co.uk/)</p>		
Outdoor navigation	<p><i>Confidence</i>: mobility assistance service for people with mild to moderate dementia. Offers location tracking, voice/video communication and a mobile care and community service on a smartphone.</p> <p>(http://www.confidence4you.eu/)</p>		
	<p>GoOV: app for assistance in using public transport, now available for local communities and care organizations (http://www.go-ov.nl/, Dutch only). Will be available for private customers 2016.</p>	Commercially available. Business model: contract with local authority or care provider	
	<p><i>Assistant</i> ('Aiding sustainable independent senior travelers to navigate in towns'): provides assistance via computer and app using public transport. (www.aal-assistant.eu)</p>		
	<p>'Happy Walker': TNO research project aiming at developing tools for support during preparation of a trip, the trip</p>		

		itself, and remembering afterwards (www.tno.nl/happywalker).		
Companion tools	Robots developed as social companions	Vughterstede is testing Aldebaran robot programmed for care, rehabilitation and animation (Zora).		
		Social Robot Teddy Bear by <i>Fujitsu</i> (http://www.theregister.co.uk/2010/10/08/social_robot_teddy_bears/)		
		Social Robot (developed within FP7 Marie Curie IAPP), finished in Oct 2015 http://mrl.isr.uc.pt/projects/socialrobot/		
		GrowMeUp (H2020) - Started in Feb 2015 http://www.growmeup.eu . This is the successor of Social Robot. This robot has learning capabilities, it can for example learn user habits, routines, etc. It can also suggest activities, and support in indoor navigation. Already includes emotion and facial recognition.	Release expected in 2017, trials Oct. 2015 (ORBIS)	
		iCat by Philips http://www.research.philips.com/technologies/robotics.html)	Development stopped	
		PARO Therapeutic robot by <i>AIST</i> (http://www.parorobots.com/index.asp)	Commercially available	

Solutions for caring and nursing tasks	Robots that can actually perform caring and nursing tasks	Care-O-bot , developed by <i>Fraunhofer</i> (http://www.care-o-bot.de/en/care-o-bot-4.html)		
		RIBA by <i>RIKEN</i> (http://rtc.nagoya.riken.jp/RIBA/index-e.html)	Commercially available	
		LEA (Lean Elderly Assistant) by Robot Care Systems. Offers help with walking, following the daily rhythm, indicates when the medications should be taken or when is the time to do exercise. Also for getting in contact with the environment. (http://www.robotcaresystems.com/en/wat-is-het/)	Under development	
		Rose by <i>Rose BV</i> (Spin off TUE). The robot 'Rose' was developed in cooperation with CbusineZ, investment part of insurance company CZ. Robot is now being tested at Thebe (Breda) and ZuidZorg, next test planned at SiZa. Advantage: Robots guarantee independence and privacy.	Commercially available Price of Rose: €10k.	OEM: EmotionFusion functionality could be a component

References:

- (1) Peetoom, K. K., Lexis, M. A., Joore, M., Dirksen, C. D., & De Witte, L. P. (2014). Literature review on monitoring technologies and their outcomes in independently living elderly people. *Disability and Rehabilitation: Assistive Technology*, (preprint), 1-24.

Appendix B Exploitation scenarios VSP

Positive scenario

Sales	price/yr €120	Target turnover (#users)							
Market size (Europe)	10.000.000	2017	2018	2019	2020	2021	2022	2023	2024
Avg Penetration grade		0,0%	0,00%	0,00%	0,04%	0,20%	0,50%	0,70%	0,90%
# VSP users	120	0	0	0	4.000	20.000	50.000	70.000	90.000
Turnover		0	0	0	480.000	2.400.000	6.000.000	8.400.000	10.800.000
Estimated costs		estimated # fte							
Personnel costs per discipline	costs/hr (€)	2017	2018	2019	2020	2021	2022	2023	2024
software engineers for development	40	2	2	2	1	0,5	0,5	0,5	0,5
project management (10%)	48	0,2	0,2	0,2	0,1	0,05	0,05	0,05	0,05
documentation+testing (20%)	39	0,4	0,4	0,4	0,2	0,1	0,1	0,1	0,1
product management	45	0,1	0,1	0,2	0,3	0,2	0,2	0,2	0,2
communication	32	0	0	0,1	0,2	0,1	0,1	0,1	0,1
support	32	0	0	0	0,25	0,5	0,5	0,5	0,5
sales	48	0	0	0	0,5	0,5	0,5	0,5	0,5
		estimated salary costs (€)							
software engineers for development		140.800	140.800	140.800	70.400	35.200	35.200	35.200	35.200
project management (10%)		16.896	16.896	16.896	8.448	4.224	4.224	4.224	4.224
documentation+testing (20%)		27.456	27.456	27.456	13.728	6.864	6.864	6.864	6.864
product management		7.920	7.920	15.840	23.760	15.840	15.840	15.840	15.840
communication		0	0	5.632	11.264	5.632	5.632	5.632	5.632
support		0	0	0	14.080	28.160	28.160	28.160	28.160
sales		0	0	0	42.240	42.240	42.240	42.240	42.240
Total Salary Costs		193.072	193.072	206.624	183.920	138.160	138.160	138.160	138.160
Server Costs (€73 pppy)		0	0	0	292.000	1.460.000	3.650.000	5.110.000	6.570.000
Out of pocket marketing costs (excl.hrs)					5.000	10.000	10.000	10.000	10.000
Result		-193.072	-193.072	-206.624	-920	791.840	2.201.840	3.141.840	4.081.840
RESULT CUM. (€)		-193.072	-386.144	-592.768	-593.688	198.152	2.399.992	5.541.832	9.623.672

Average scenario

Sales		price/yr €120		Target turnover (#users)					
		2017	2018	2019	2020	2021	2022	2023	2024
Market size (Europe)	10.000.000								
Avg Penetration grade		0,0%	0,00%	0,00%	0,00%	0,03%	0,15%	0,40%	0,60%
# VSP users	120	0	0	0	0	3.000	15.000	40.000	60.000
Turnover		0	0	0	0	360.000	1.800.000	4.800.000	7.200.000
Estimated costs		estimated # fte							
Personnel costs per discipline	costs/hr (€)	2017	2018	2019	2020	2021	2022	2023	2024
software engineers for development	40	3	3	3	3	1,5	0,5	0,5	0,5
project management (10%)	48	0,3	0,3	0,3	0,3	0,15	0,05	0,05	0,05
documentation+testing (20%)	39	0,6	0,6	0,6	0,6	0,3	0,1	0,1	0,1
product management	45	0,1	0,1	0,1	0,2	0,3	0,2	0,2	0,2
communication	32	0	0	0	0,1	0,2	0,1	0,1	0,1
support	32	0	0	0	0	0,25	0,5	0,5	0,5
sales	48	0	0	0	0	0,5	0,5	0,5	0,5
		estimated salary costs (€)							
software engineers for development		211.200	211.200	211.200	211.200	105.600	35.200	35.200	35.200
project management (10%)		25.344	25.344	25.344	25.344	12.672	4.224	4.224	4.224
documentation+testing (20%)		41.184	41.184	41.184	41.184	20.592	6.864	6.864	6.864
product management		7.920	7.920	7.920	15.840	23.760	15.840	15.840	15.840
communication		0	0	0	5.632	11.264	5.632	5.632	5.632
support		0	0	0	0	14.080	28.160	28.160	28.160
sales		0	0	0	0	42.240	42.240	42.240	42.240
Total Salary Costs		285.648	285.648	285.648	299.200	230.208	138.160	138.160	138.160
Server Costs (€73 pppy)		0	0	0	0	219.000	1.095.000	2.920.000	4.380.000
Out of pocket marketing costs (excl.hrs)					5.000	10.000	10.000	10.000	10.000
Result		-285.648	-285.648	-285.648	-304.200	-99.208	556.840	1.731.840	2.671.840
RESULT CUM. (€)		-285.648	-571.296	-856.944	-1.161.144	-1.260.352	-703.512	1.028.328	3.700.168

Conservative scenario

Sales		price/yr €120		Target turnover (#users)						
Market size (Europe)	10.000.000	2017	2018	2019	2020	2021	2022	2023	2024	
Avg Penetration grade		0,0%	0,00%	0,00%	0,00%	0,00%	0,02%	0,10%	0,30%	
# VSP users	120	0	0	0	0	0	2.000	10.000	30.000	
Turnover		0	0	0	0	0	240.000	1.200.000	3.600.000	
Estimated costs		estimated # fte								
Personnel costs per discipline	costs/hr (€)	2017	2018	2019	2020	2021	2022	2023	2024	
software engineers for developme	40	4	4	4	4	4	2	0,5	0,5	
project management (10%)	48	0,4	0,4	0,4	0,4	0,4	0,2	0,05	0,05	
documentation+testing (20%)	39	0,8	0,8	0,8	0,8	0,8	0,4	0,1	0,1	
product management	45	0,1	0,1	0,1	0,1	0,2	0,3	0,2	0,2	
communication	32	0	0	0	0	0,1	0,2	0,1	0,1	
support	32	0	0	0	0	0	0,25	0,5	0,5	
sales	48	0	0	0	0	0	0,5	0,5	0,5	
		estimated salary costs (€)								
software engineers for development		281.600	281.600	281.600	281.600	281.600	140.800	35.200	35.200	
project management (10%)		33.792	33.792	33.792	33.792	33.792	16.896	4.224	4.224	
documentation+testing (20%)		54.912	54.912	54.912	54.912	54.912	27.456	6.864	6.864	
product management		7.920	7.920	7.920	7.920	15.840	23.760	15.840	15.840	
communication		0	0	0	0	5.632	11.264	5.632	5.632	
support		0	0	0	0	0	14.080	28.160	28.160	
sales		0	0	0	0	0	42.240	42.240	42.240	
Total Salary Costs		378.224	378.224	378.224	378.224	391.776	276.496	138.160	138.160	
Server Costs (€73 pppy)		0	0	0	0	0	146.000	730.000	2.190.000	
Out of pocket marketing costs (excl.hrs)					5.000	10.000	10.000	10.000	10.000	
Result		-378.224	-378.224	-378.224	-383.224	-401.776	-192.496	321.840	1.261.840	
RESULT CUM. (€)		-378.224	-756.448	-1.134.672	-1.517.896	-1.919.672	-2.112.168	-1.790.328	-528.488	