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Miraculous-Life

Miraculous-Life for Elderly Independent Living

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Abbreviations

<i>Abbrev.</i>	<i>Description</i>
AAL	Ambient Assisted Living
ADL	Activities of Daily Living
CA	Consortium Agreement
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 are 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 version of the Business Strategy Report an initial 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 can 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 intend to create a business case per tool or service. This version of the Business Strategy contains business cases for technologies as developed by Noldus, Fraunhofer and CiTARD. Once

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

the first two pilot trials have been completed, we will be able to update the business cases, and create business cases for other tools and services developed within Miraculous-Life, also in EU-countries other than the two where the pilots are taking place (Switzerland and the Netherlands).

The objective of the Miraculous-Life project is to attract both commercial and industrial interest in the project's technology and results at European and international level through an exploitation plan. The initial exploitation plan has been described together with the partner exploitation plans. The exploitation results for the pilot countries will be used as a starting point for the European-level exploitation. In this version of this deliverable, a first ROI estimate has been given for one of the tools developed within this project, the EmotionFusion tool. This estimate shows that break-even point for this tool can be reached in 2019.

Regarding contribution to standards, two approaches will be followed. On the one hand, the project will contribute in improving existing standards that are under development. On the other hand, it will put significant emphasis on paving the way for standards that are foreseeable in the future by monitoring 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 will work towards standards to ensure that the research activities are aligned with the existing and future trends.

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 three 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 three business cases that may contain different exploitation strategies for the two pilot countries, as examples for exploitation in similar countries throughout the EU.
- 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 upcoming standards for the various topics during 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.
D7.4	Business strategy report: describes the business cases and defines marketing strategies and the plan for exploitation at European level.
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 currently 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 a first estimate of ROI.

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.

According to the original project planning, two pilots would have been carried out and completed within this task as part of the market exploration, and would have enabled us to describe these cases and their results in this deliverable. Since the pilots have not yet been completed, this will be done in deliverable 7.3.3 (version c), where a more detailed calculation of the expected ROI will be given, and an updated version of the business plan.

Appendix B gives an inventory of AAL solutions available in the market, while Appendix C summarizes the main new content planned for deliverable 7.3.3 (version c).

1.4 Differences with previous version

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

- The Business Strategy Report (D7.4) has been merged with this deliverable (section 3).

- Section 2.2: updated market size figures from Switzerland, The Netherlands, Cyprus and Germany.
- Section 3.2: plan for economic evaluation added
- Section 3.4: new business cases have been added (CiTARD, Fraunhofer, Noldus)
- Section 4.3: updates exploitation plans from Fraunhofer, MRPS, Noldus, ORBIS
- More information about competition has been added (section 2.4.1 and Appendix B).
- Section 5 (standardization) has been updated and expanded with an overview of standards.

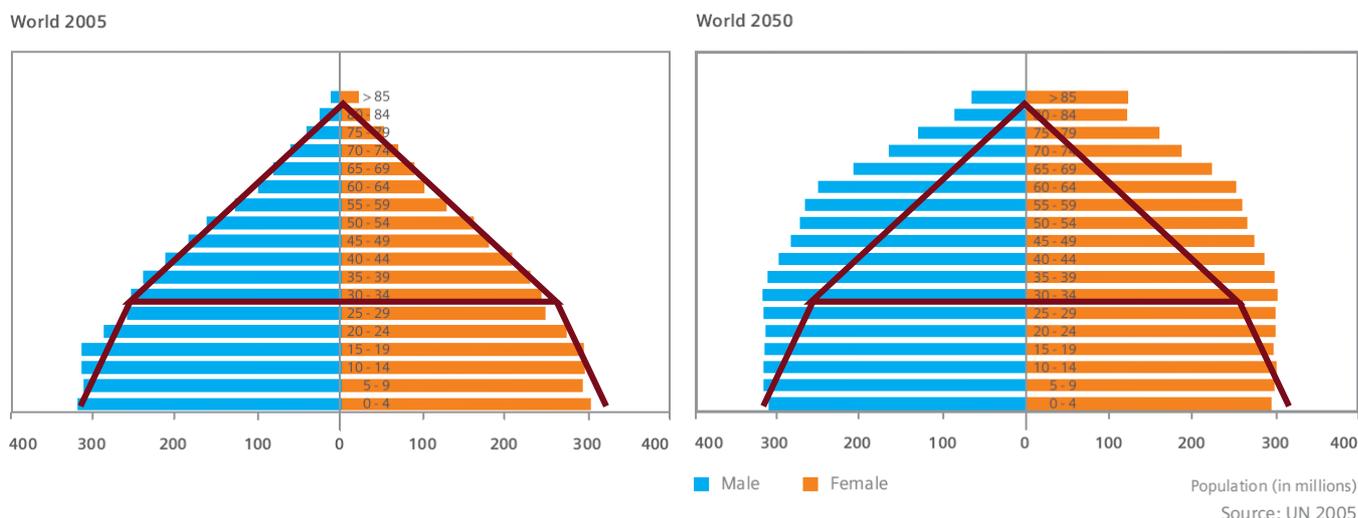
Apart from these major updates, there have been numerous minor changes.

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.

- 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 access².
- 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 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 %.

² The World in 2013 – ICT facts and figures (ITU, February 2013), <http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2013-e.pdf>

- 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

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"]³ **Error! Reference source not found.** 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 exported outside Europe. These figures show there is a huge potential.

A study by the Dutch consultancy Companen in 2012⁴ shows that the number of elderly living at home but with a need for care will rise from 0,9% in 1,5% of the total population between 2012 and 2022. This was based on a study in the Sittard-Geleen area, a community with approx. 100.000 inhabitants. Extrapolating this figure shows that, only in the Netherlands, there will be approx. 250.000 elderly living at home with need of support in 2022. Extrapolating this figure to the EU indicates that the total potential is approx. 5 million people in 2022.

In Switzerland we see comparable trends as in the Netherlands: according to the Swiss Federal Statistical Office (<http://www.bfs.admin.ch/>), 20% of the seniors (+65 years old) living in a private household are unable to perform at least one instrumental activity of daily living (IADL), and are thus in need of support. This is a group of approx. 280.000 people, but this includes people not living alone. The percentage of persons limited in IADLs rises with age (14% aged 65-79; 38% aged +80), and women (47%) are more likely to be limited than men (27%) in the same age range. 3% of Swiss seniors (aged +65) living in a private household are also unable to perform at least one activity of daily living (ADL) without help or only with great difficulty. Not surprisingly, the proportion of older person limited in ADL rises with the age (2% aged 65-79; 8% aged +80).

³ 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.

⁴ Actualisatie programma wonen met zorg ouderen (Companen, June 2012)

According to a Cyprus government report (Cyprus in Figures, 2014) the country has the lowest dependency ratio for the elderly (65+) in the EU, with approximately four working age people for every person aged 65 or over. In the EU the average is three. In Cyprus the proportion of old-aged persons 65 and over increased to 13,9% in 2013, compared to 12,7% in 2010 and 12,2% in 2005. There was a gradual increase in the proportion of old-aged persons and a decrease in the proportion of children demonstrating the ageing process. Data provided in a European Commission report for 2015 suggests further that the population in the government controlled areas over 65s is expected to double, from 13,4% in 2013 to 27% in 2060. The policies of social welfare services form an integral part of the Government's overall policy for social and economic development thus raising awareness and opportunities for care technologies in this market.

In Germany the number of persons requiring care was at 2.63 million, approximately 70% of them receiving care at home⁵ **Error! Reference source not found.** Previous expectations have been exceeded. The number will grow to about 3 million by 2020. There is already a strong lack of care personnel projected to be getting even stronger in the future. This makes Germany one of the largest markets for care technologies in the world.

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 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.

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.

⁵ Pflegestatistik 2013 - Statistisches Bundesamt -

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

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 here⁶):

- 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:

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, but in the final target group definition we may have to narrow this down.
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 hard to answer at this stage. Whether they are able to pay 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.

⁶<http://www.yourarticlelibrary.com/marketing/11-criteria-for-effective-market-segmentation-marketing-management/22180/>

2.4 Porter's five forces model

Porter's five forces model⁷ 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 ⁸ **Error! Reference source not found.** 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 in The Netherlands 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.
- Solutions for interacting and supporting people with need for assistance remotely. There are many examples of such tools, the main 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.

⁷ Porter five forces analysis: Porter, M.E. (1979) How Competitive Forces Shape Strategy, Harvard Business Review, March/April 1979

⁸ Miraculous-Life D1.1a: Specification of user needs analysis and design of VSP model

- 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.

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 **Error! Reference source not found..**

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 will be 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 mainly 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). Partners involved in the development of those products will create common exploitation plans but also individual business plans of how to exploit them. IPR issues between partners will be based on agreement rules and terms that will be defined in a Consortium Agreement.

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 finance 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.

3.2 Benefits and USP's of the VSP

In paragraph 2.3 we identified possible market segments. During the course of the project we have to make a final decision whether to target all segments, or whether we will select

one or more specific segments as target group for specific solutions developed within this project. In addition we then have to decide whether to apply a generic strategy for all target groups, or to differentiate the proposition per target group.

Benefits offered differ per party in the chain between supplier and end user. During the remainder of the project, we have to decide which values are most important, and choose which added value we want to focus upon. We also have to specify which benefits are actually USPs, based on more detailed competitor analysis. Once we have also selected target groups, we can define the value proposition. This paragraph lists the main benefits of the total solution, the VSP, as originally proposed to develop within the scope of this project.

In a number of cases it is possible to quantify these benefits by looking at the economic value which they generate. A number of the objectives as specified within 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 elder 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 elder 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 will enable 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, at least within the time span of this project). If these objectives are met, we have 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. This can also be a financial benefit for insurance companies or governments, depending on how the care is organized and financed in a region. Proving the economic value will certainly help to convince these parties to invest in the system as developed within Miraculous-Life.

3.2.1 End user

For the end user, the elderly, the main benefit will be improved independence because of the support offered by the VSP and the increased sense of safety.

A second benefit will be that the increase of quality of living, motivation and positive interest can also help preventing early degradation of skills and capabilities. Because the VSP offers human-like emotional and behaviour understanding and appropriate responses, it will be more engaging and natural and thus more effective than other assistive tools without this functionality.

Finally the solutions developed within this project will stimulate elderly to keep or even increase social interactions, and to remain active, which will improve their feeling of well-being.

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 provide increased continuity and efficiency (time saving and thus cost saving). This will improve quality of care provision and reduce workload, stress, and demand for resources.

3.2.3 Insurance companies

The introduction of these technologies will have a positive influence on the health situation of elderly, and will therefore help to reduce costs of care and assisted housing, thus decreasing the costs for insurance companies.

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.

3.2.5 Relatives

For children and other relatives who often also 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.

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 in their solution.

In the market analysis, we 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

Main actual products developed within this project:

- 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.
- Co-Net tool 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 will 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 have two options which need to be worked out:

1. Offer one generic product.
2. Modular approach: differentiation of products for different target groups, which means different functionality and possibly price setting depending on the targeted segment.

It is possible to start with one product at the moment of release, and differentiate during the lifecycle of the product. This still needs to be decided during the course of the project.

We also need to decide on the device to be used. First market feedback shows that tablets or a dedicated device is most popular.

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. Willingness to pay and the amount people are willing to pay is a subject for further research.
- 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.

Exact price levels have to be defined during the course of the project, while it also has to be considered whether to differentiate pricing per segment. It is possible that different parties finance a system, for example one pays for the hardware, and the other for the license subscription. This will be the starting point for setting up a revenue model. Insurance systems and policies vary a lot between European countries, which might force us to introduce different business models in different countries. In the first stage, the situation in Switzerland and the Netherlands will be used as starting point.

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

The final distribution strategy has to be decided during the course of this project, but a combination of the channels above is also possible. The actual way of distributing (for example via online sales or personal sales) also needs to be decided.

3.3.4 Communication VSP

Similar to the distribution and pricing strategy, the communication strategy also depends on the actual selected target groups. The communication mix will be a combination of online and offline actions, for example:

- 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.

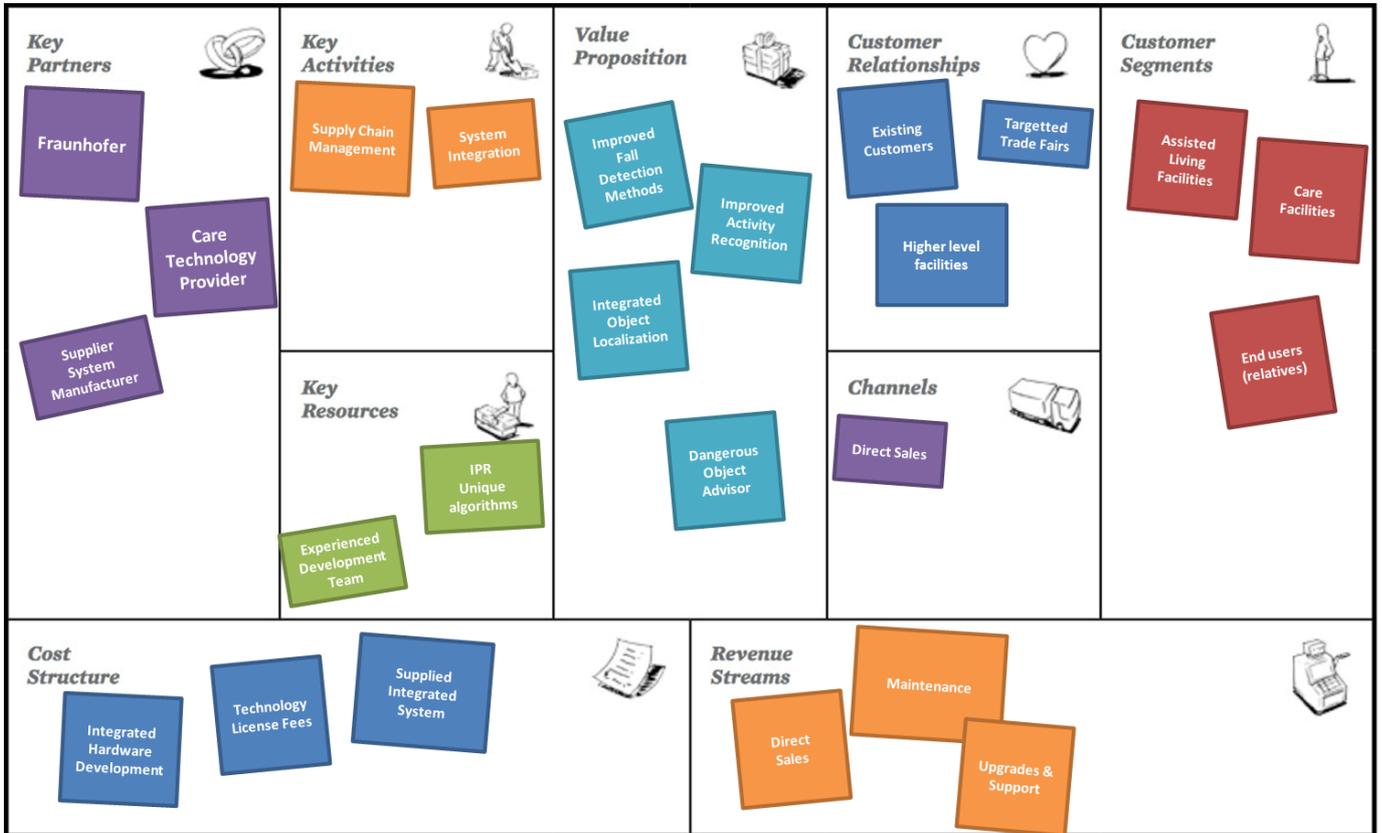
- Social media, amongst others blogs in relevant LinkedIn groups such as ALIANCE (European Ambient Assisted Living Innovation Alliance, 646 members) or AAL (Ambient Assisted Living Joint Programme, 877 members).
- Relevant conferences (such as AAL Forum) and public exhibitions targeted at elderly.
- Product leaflets.
- Advertisements in relevant magazines, either targeted at the end user or at other stakeholders.

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 Osterwalder⁹. During the final stage of the project, we need to decide whether the VSP will be commercialised as a total solution as well. In this case, we need to set up a business case for the VSP as a whole. 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.

⁹ 2010. Business Model Generation, A. Osterwalder, Yves Pigneur, Alan Smith, and 470 practitioners from 45 countries, Wiley published

3.4.1 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 object 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.

3.4.2 Noldus: EmotionFusion Tool

Within Miraculous Life, Noldus is developing 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 (or 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.

The graphical representation of the Business Model Canvas can be accessed via this link: https://canvanizer.com/canvas/-pqhfbWsM_4.

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 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 will have a positive influence on the health situation of elderly, and will 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 will 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 will develop 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 could release the EmotionFusionTools as an independent product, or as a 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 from combining all the available information. 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: At this moment, Noldus does not have the right channels for direct selling to end-users, relatives or care givers who need a ready-to-use tool. Therefore we should 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 nation-wide 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 can 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 can 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.

Whether this model will be sustainable, has to be investigated during the remainder of this project.

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

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: 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. 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 provides 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 Citard's 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.

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 although as first option a licencing scheme is expected to be implemented. 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.

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. A successful pilot running is tightly associated with strict requirements regarding timely delivery, dependability and user-friendliness of the deployed technology. The evaluations undertaken in the two pilots will show the effects on the individual and calculations will be made on the cost/benefit of using such a solution. As a result, we will have services, but also evaluations, which give supportive evidence about their usability and applicability, accelerating their take up in the market.

4.2 Sources of finance for commercialization

For each country represented by at least one partner within the project a list of organizations that may be interested in making use of the project outcome will be prepared. We will also investigate what the possibilities for funding for example by insurance companies can be. In case of a successful trial's outcome, and provided the system meets the needs of residents, the first big customers to take up the system are the two participating end-user organizations ORBIS and MRPS. Those two are working close with insurance companies for the provision of elderly homecare. Already 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 introduction of innovative technologies in elderly care reducing thus care cost in the next years. CZ has already agreed that in case of a successful Miraculous-Life trial a financial plan will be put in place for having the system being commercialized and taken up in the ORBIS homecare provision set-up. 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 similar projects. 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.

4.3 Individual exploitation plans

4.3.1 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 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 middleware platform, will be fed into Austrian pilot projects where existing and newly set-up smart homes for elderly will be equipped and powered by AAL solutions by AIT. AIT has recently been selected for funding of a regional pilot, where 50 flats will be equipped in close collaboration with the powerful care organization Arbeitersamariterbund.

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 has the current presidency of AAL Austria – the most prominent network of AAL stakeholders in Austria including research organizations, companies and user organizations).

4.3.2 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 will 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”.

4.3.3 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.

4.3.4 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 will be 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. 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.

4.3.5 Fh-IGD

As a non-profit research oriented institution Fh-IGD is firstly interested on generally increase knowledge in up-to-date solutions for a future AAL market in order to support the industry for the breakthrough 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, making use of Kinect-based technologies considering 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 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 provider before 2018, so products can hit the market in 2019.

4.3.6 Noldus

Noldus will most likely focus on the exploitation of components such as the EmotionFusion tool, including FaceAnalysisServer, and constituent technologies that will result from the project. 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 and acceptable price levels, (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.

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. For a first estimate of the ROI we have made the following assumptions:

1. Introduction of a solution incorporating the EmotionFusion tool in 2018.
2. Penetration in the first year 0,1% (10.000 users), growing to 1% by the end of 2020.
3. Costs:
 - a. Personnel costs (development, documentation, testing, marketing, sales, support): the first year after end of the project (2017) we need to invest approx. €260k, next years €140k per year.
 - b. Out of pocket marketing costs for leaflets etc.: €10k per year.
 - c. Server costs for analysis: €0,01 per image. The number of images to be analysed in order to get a good insight into emotional state of a person is estimated to be 20/day. If this is feasible, server costs per participant are €0,2/day = €73/year.

Based on a subscription price of this service of €10 per participant per month, turnover would increase to almost €10 million in 2020. We expect already in 2018 the result can be positive, while the break-even point will be in 2019.

During the remainder of the project we have to get a better idea whether the assumptions on which these calculations are based, will be feasible. In the final version of the exploitation plan, we can also extend this estimate with an optimistic and conservative scenario.

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.

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.measuringbehaviour.org). This interdisciplinary biennial event, which will be held for the 10th time in 2016 with over expected 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.

4.3.7 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.

4.3.8 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 elder 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.

4.3.9 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.

5 Standardization strategy

Regarding contribution to standards, two approaches will be followed. On the one hand, the project will contribute in improving existing standards that are under development. On the other hand, it will put significant emphasis on paving the way for standards that are foreseeable in the future by monitoring 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 will work towards standards to ensure that the research activities are aligned with the existing and future trends. The project partners will make use of their already participations in different international standardisation organizations, industry bodies and consortia (like Continua, ALLOA, CEN, IEEE, W3C), to contribute in the different standard activities (*c.f.* 3.1.1g.)

5.1 Existing standards

Paragraph 5.1.1 gives an overview of existing standards in the context of care and standardization. This can provide us more insights in the used terminology, which words are common / language is spoken and classification methods are there available. 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. This might give us important information for the technical approach of the Miraculous-Life system and might have impact on the acceptance and value of the system.

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 2014¹⁰. Following is a detailed comparison of classifications from the report:

¹⁰ 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)

Table 2: 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 research. Subsequently, there was an ordering structure required.

Table 3: 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.

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 Future trends

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.

In the Netherlands there is agreement (Vilans, July 2014) between twenty care organisations and insurance companies¹¹ for an exploration of the use of the Omaha system¹² in the local care.

5.3 Activities for standardization

5.3.1 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

5.3.2 Noldus N-Linx

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). 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> .

¹¹<http://www.zorgvisie.nl/F2R/?returnurl=%2fKwaliteit%2fNieuws%2f2014%2f10%2fOmaha-System-wint-snel-aan-populariteit-1615414W%2f>

¹² 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.

5.3.3 Relation to the Miraculous-Life system

The current Miraculous-Life system is not built upon or using one of the described standards, middleware techniques and knowledge which was available at the partners has been used to setup the system so far. The available standards and how it relates to the current Miraculous-Life system must be further analysed to define next steps, this will be described in the next version of this deliverable.

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 The Netherlands.

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/website/inside-out/#events	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, medicin 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>Lokalisation beased 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 	Available from MIZO Woonondersteuning B.V.	
	<p><i>MEMOmessenger</i></p> <p>(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. 	Commercially available	
	<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</p> <p>(http://www.virtask.nl/wordpress/anne-thuiszorg, Dutch only, but the tool is</p>	Commercially available. Business model: for private users pay per use, or as part of a care	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/)</p>	<p>agreement (€60-80 pm)</p>	
	<p><i>Viedome</i>: digital platform for caregivers and elderly for example for communication, wander detection, security, etc. (www.viedome.tv).</p>	<p>Commercially available</p>	<p>OEM: EmotionFusion functionality could be a component</p>
	<p><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)</p>	<p>Commercially available</p>	<p>OEM: EmotionFusion functionality could be a component</p>
	<p><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/).</p>	<p>Looking for funding; business model will be subscription based</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>		

		(http://www.confidence4you.eu/)		
		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.	Commercially available. Business model: contract with local authority or care provider	
		<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)		
		'Happy Walker': TNO research project aiming at developing tools for support during preparation of a trip, the trip 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 A/ST 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	
		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.	Commercially available Price of Rose: €10k.	OEM: EmotionFusion functionality could be a component

		Advantage: Robots guarantee independence and privacy.		
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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 Planning next version

	Vers. C (November 2016)
Market Information	Market size information added for other EU countries than Germany, Switzerland, The Netherlands Update competitors overview (appendix B)
Business cases	Analysis of possibilities to adapt business cases in other EU countries Updated Business Plans Fraunhofer, Noldus Business Plans AIT, UniGe, UCY, CITARD, ZOOBE
Proposition	Proposition for other EU countries: <ul style="list-style-type: none"> • Target groups • USPs (based on success indicators as defined in DoW) • Product strategy • Price strategy • Communication strategy • Distribution strategy
Exploitation	Exploitation plan VSP Exploitation plans partners including ROI (except MRPS /ORBIS)
Standardization	Updated standardization strategy