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First Report on Service, Business and Marketing Models for Robot-Era Services

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Executive summary

This is the first Report on Service, Business and Marketing Models for Robot-Era Services. The goal of the deliverable is to describe the activities made and results achieved in defining the models of Robot-Era Services and also considering them from a business and marketing point of view.

With respect to the architecture of the project, the deliverable collects theoretical and empirical results of Task 9.1 that is focused on service model; Task 9.2 that considers business models, and Task 9.3 that is devoted to the marketing models for Robot-Era services.

To achieve results related to the 9.1-9.3 tasks, the methodology we have indicated was to design the new services and the business and marketing supports on the basis of the current services.

We proposed cost-effectiveness and cost-benefit techniques for designing the new models.

So, as it clearly appears, the methodology we have adopted is an ex-post analysis, since it needs outcomes and data from the technical units of the projects and it can be conducted once the experimental phase of the project is at a more advanced level.

Therefore the analysis and the considerations presented in this report are based on preliminary data. Nevertheless, they appear very interesting and promising for the finalization of the study.

The deliver shows the following outcomes:

- 1) a preliminary analysis of the current service model
- 2) the analysis of the different stakeholders involved in delivering services e.g., service providers, Municipality;
- 3) the business model;
- 4) a first analysis of the final users collecting data from service providers;
- 5) a preliminary description of the first tests of Robot-Era services in terms of:
 - a) the Robot-Era service model;
 - b) business model;
 - c) marketing model;
- 6) preliminary models of Robot-Era services for Robot-Era services that are not still tested.

Another reason explaining why the analysis is preliminary is that Örebro experienced some problems in involving service providers and final users.

With the Örebro partner we are defining a strategy in order to cope with these difficulties.

As a consequence, all the information and analysis come from the Peccioli Municipality.

At any rate, these data are very interesting and they have been deeply analyzed. Now we have a clearer idea of the model of services with robot according to people' needs, their characteristics in terms of diseases and how the robot can improve the organization of the current services.

These data offered important inputs highlighting the current barriers for a sustainable diffusion of robot services for the elderly. They have been considered in the analysis of current services as well as they will be kept in mind for designing the final models of services.

The most important lesson we have learn from the analysis of the current services in the perspective of the new ones is that the system of the current solutions cannot be completely substituted by robot.

It is not because there are high barriers in terms of interest and antagonist forces (e.g., by current carers and people that consider robot as a direct competitor in their activities) against the introduction of robot in the system.

It is not because the added value of using robot can appear limited.



It is not because it is difficult to imagine a system of reimbursement for robot in delivering specific services.

The point is that there are some technical limits. In some activities, services provided with the robot technology could be less indicated because they could be perceived as too complex with respect to human activities. In specific services, such as assisted bathing, human being could be considered a better technology than robot.

For other services e.g., laundry, shopping and drug delivery, robot technology is better than human being because it is more efficient, saving time and work.

Introduction

The success of a product innovation depends on outstanding quality, new functionalities and a high level utility value. For that an accurate defined overall concept is needed. That includes a careful research on the target market to define product requirements and user benefits. If a product innovation should be successful integrated into the market one should have sufficient knowledge about the customers, the markets, and the competitors. One challenge is to merge all those factors and form them into an acceptable package also regarding social, legal and environmental claims.

- What do factors influence service, business and marketing models for a robot? Some approaches:
- Who are the main target groups?
- Who will use the robots?
- Who will buy the robots?
- Who will offer the services needed?
- What communication channels are suitable (depending on each target group)?
- What do create interest in the robots? What do create fears and might prevent from market success?

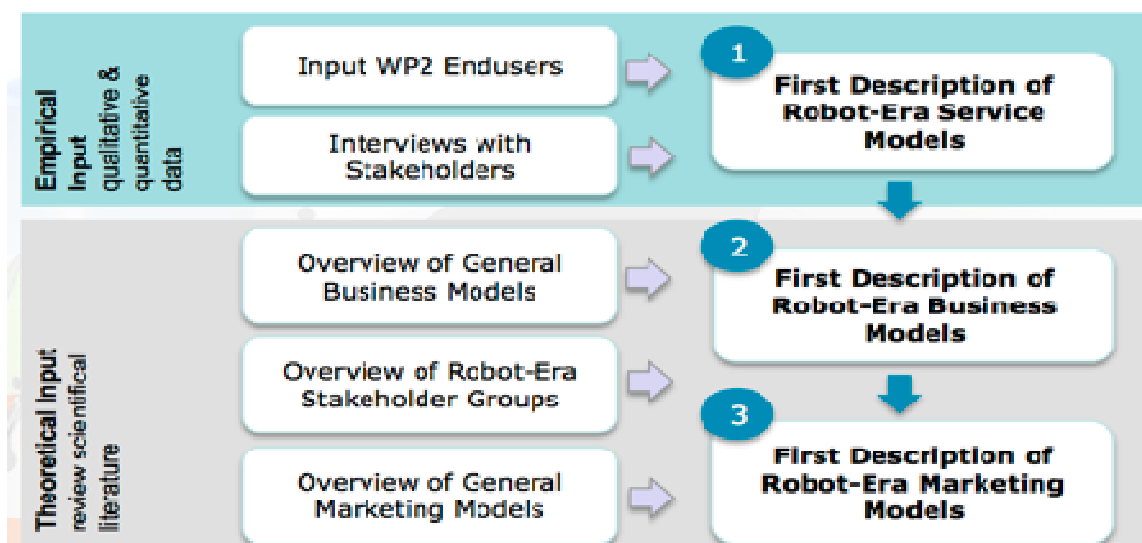


Figure 1. Deliverable articulation

There are questions that are answered through an articulated path of analysis represented in the deliverable.

The main structure of the document is based on two macro sections. The first one can be considered the theoretical and methodological approach, articulated in its three components of hypothesis, tools, methodology and approaches adopted for the model of Robot-Era services, and the business and market models related.

The second section is the application of the theoretical and methodological part and its outcomes: a first description of service model, a first description of business model, a first description of the marketing model for Robot-Era services.



Since the first description of service and business models for Robot-Era is based on current services, a relative big section is dedicated to the analysis of the current solutions in terms of the stakeholder involved, characteristics of the demand for services, the system of reimbursement and co-payment that actually prevails.

The deliverable ends with some recommendations and indications of the next activities within the Robot-Era project.

1 Background

1.1 Importance of Service, Business and Marketing Models for the Success of Robotics and Radical Innovations

The design of service, business and marketing models is a necessary step to do for increasing the probability of a long run success of robotic and very innovative technologies.

The present deliverable analyses and describes the collection of instruments and outcomes that can help technology to leave the laboratory and the technical testing, and enter the market.

The quality of the technology and the goodness of the product is not a sufficient element that guarantees its large scale diffusion.

The goodness and quality of a technology and the degree of technical innovation embedded is an evaluation that is made by engineers and technicians of the Patent Office.

Innovation and radical innovations are words without a technical meaning in the market of goods and services. "Innovation" and "radical innovations" are used as marketing labels and words to attract potential users. A potential user cannot be only interested in novelty but his point of view is on the capability of the solutions to overcome old and new problems.

So, according to the market, innovation of robot technology cannot be considered a proxy of the level of technology embedded in the proposed solution. Innovative is the way that technology selects to resolve problems.

Robotics has often suffered by the fact that a lot of technology and resources have been employed to mimic how human being and animals act for resolving problems. Human beings and animals have been considered a benchmark for robotics. In this perspective, however, the main benefits obtained are a deeply analysis of what human beings and animals do, on one side, and the potential benefit of robot, on the others, since in particular circumstances (in most cases human being are more efficient in a lot of activities than the robot if we compare the amount of energy employed and the outcomes achieved) robot could be more efficient than human being from a quantitative point of view.

In this perspective robotic technology is inclined to give more and more efficient but known solutions to old problems, through a refinement of technology. So all the services that embed robotic technology, need a very high support in modelling, high efforts for designing business and marketing strategies for being adopted.

All the barriers to robotic diffusion for service comparable with the Robot-Era project can be potentially overcome only with high investment in the complementary activities able to guarantee a long run sustainability of the robotic solution. These activities include: the model design i.e., how robot technology can be integrated in the existing or in a new system of stakeholders and technology that have a different level of complexity with respect to robot; the business model that have the goal to produce strategies able to assure the financial sustainability of the system in which the robotic technology can be adopted; the marketing models have the end to suggest strategies able to eliminate the distances between demand and supply, basically reducing the perceived gap between problems and the solutions proposed.

1.2 Market Analysis / Market Potential

From other research projects (e.g. ALIAS) in robotics and from earlier user inclusion research in Robot-Era (WP2), analysis results can be transferred to the market study in Robot-Era, since the products aim to solve very similar tasks. Thus, in the ALIAS project we examined three potential groups of people, whose views and wishes have a great potential impact on the success of Robotics and possible further necessary adjustments. The groups were Elderly People with all levels of autonomy, relatives and caregivers and also managers

of care institutions (who might be among the first buyers of robots and have the highest financial benefit of their use). The most relevant results are explained afterwards. Moreover, the primary and secondary users have been involved in WP2 research extensively.

1.2.1 Customer benefit from stakeholder groups of view

According to the study results only a restricted number of current seniors themselves will buy such a robot. Another very relevant target group are technically affine people (e.g. also relatives) with middle and high incomes that are closely related to single seniors. For work or other reasons these relatives live away from the seniors, but they worry about the senior living alone at home. So, at the moment they can give him or her a call or travel for being present. In many cases travelling cannot spontaneously be done, it needs to fit into the daily agenda and in many cases it takes a lot of time. In case of emergency situations, they are not able to detect them and cannot react fast enough. On the one hand, there is a need to support the senior in the everyday life and to be present for him or her in case of emergencies; on the other hand the relatives have private and professional goals that are in conflict with these kind of presence. The robot resolves this conflict for the relatives, because it spontaneously allows a virtual visit at any time, it supports daily activities and reduces the need for attendance, and in case of an emergency situation it can help to react quickly. It gives the relatives a peace of mind. So this group is potentially more willing to pay for robots – which has been also proved by the WP2 research (cf. Robot-Era D2.3). This group might buy or rent the robot and give it to their seniors as a present. This gives a good feeling to donate something really useful to their loved ones because they don't just give him or her a robot, actually they donate common time and independence. Even if it is a quite expensive present, when one robot is at one senior, its services can be provided to several relatives of the same senior, so it could also be a common present of several relatives. Care Institutions might also benefit strongly from the use of robotics: Medication distribution procedures in nursing homes typically are time consuming for the nursing staff. Mobile robots might support rehabilitation, medication and documentation tasks as well as logistics, such as the planned laundry and food delivery, and last but not least surveillance scenarios. Compared to the traditional working procedures, this avoids failures and saves personnel costs. There is also an upcoming shortage of qualified nursing staff, which creates even more needs for robotic support.

1.2.2 Potential benefits for stakeholders involved in the current service delivery

Considering stakeholders different from final users and their families, and involved¹ in the current service delivery as potential recipient of Robot-Era solutions, there are different potential benefits for them. The rate of adoption of robots will depend on the comparison between perceived benefits and costs.

Table 1. Potential benefit of Robot-Era solutions according to different stakeholders involved

Stakeholder	Potential benefit
Municipality	Increasing the citizens' health offering efficient services also for people with reduced mobility and low income.
Service provider	Increasing in the efficiency of services delivered through

¹ A detailed description of the different stakeholders involved is in the section dedicated to the analysis of current service models.



	<p>robots that can save a lot of time and resources for activities that need no human relationships e.g., shopping, garbage transportation, laundry, etc. In addition, robot solutions may reduce the costs related to manage highly heterogeneous final users through a useful distinction between processes and activities that can be standardized and activities that need a final user customization.</p>
<p>Regional or/and The National Health systems</p>	<p>An increasing saving of health resource consumption because of reduced hospitalization of the elderly induced by an improving of solutions for monitoring and assisting them, at home. The impact of Robot-Era solutions on the health resource saving will be proportioned to the degree of health services that will be delivered within Robot-Era. The needs for more efficient solutions in health service delivery and so an increasing demand for robot solutions will probably follow the trend in health policy of western economies: a drastic health costs containment. In this Robot-Era solutions may have potential benefit for the regional and national health care systems (balancing the impact of costs) if the robotic technology is used for a very large set of final users and it is able to improve the territorial health, avoiding useless hospitalizations.</p>

1.2.3 Market size

Focusing the German market, there are 6.8m men and 9.3m women with an age over 65 years². About 19% of the elderly men and 45% of the elderly women live alone at home³. According to the Eurobarometer about 62% of people over 55 have in general a positive view of robots⁴, so we assume that we currently have about 3.4m potential users in Germany.

From the customer's side we have about 6.4m households in Germany with a net income which is higher than 3.200 EUR per month, that are about 16% of all households⁵. Assuming that the income of the relative is in general independent from related single seniors, we can say that we have 550.000 potential users that have relatives that can afford such a robot. There is another interesting figure taken from the Eurobarometer saying that at present just 6% of the persons in Germany could imagine having their children or elderly parents minded by a robot⁶. If we take this figure into account we have about 30.000 potential customers in Germany. Even though prices are not fixed for a final product, and thus the market volume can not determined, we would have a market that easily exceeds 200 Million EUR.

Our own interviews and the results of ALIAS support this approach and our assumptions: on the one hand there is a low willingness to pay among the elderly for robots, but at least 70% of the relatives could imagine a price between 4 and 10kEUR. The majority of the interviewed interested elderly people and relatives in ALIAS likes the idea to rent such a

2 Statistisches Bundesamt, DESTATIS, GENESIS data base, table 12411-0006, reference date 31.12.2010.

3 Cf. <http://www.sueddeutsche.de/leben/so-viele-ein-personen-haushalte-wie-nie-land-der-alleinlebenden-1.1409712-2> (30.4.2013).

4 Cf. Public attitudes towards robots. Special Eurobarometer 382, European Commission, May 2012, p. 20.

5 Bundeszentrale für politische Bildung/Statistisches Bundesamt, Mikrozensus, Figures from 2007.

6 Cf. Public attitudes towards robots. Special Eurobarometer 382, European Commission, May 2012, p. 47.



robot. The robot could be taken back and reconditioned, if elderly people are facing more serious problems, which make them all but impossible to use such a product. The target group is also attracted to a potential lease program. The interviews from ALIAS and Robot-Era showed that the mean rent should be between 100 EUR (older people) and 120€ (relatives, affiliates) per month. Developing is a rent/lease model is more attractive to back up higher production costs.

The interest and acceptance of the robot in professional care is smaller compared to the domestic users. 75% of the interviewees would rent a robot, but a monthly lease was not specified.

We believe that in case of a successful product launch, because of the demographic change and the penetration of technologies in our everyday life; because of the attitudes to the approach to assist elderly people with robots changes, the market size could strongly increase in the future.

Looking to the market of care institutions and nursing homes, the advantages of hospitals and nursing homes compared to apartments are a higher capacity utilization associated with lower costs per hour, more standardized operational environment and a business-to-business (B2B) strategy with the possibility to calculate and compare cost savings.

The solution can be sold to providers of nursing homes and hospitals in Europe. Nursing homes are prevalent in all western countries, adding up to about 50,000 across Europe, estimated and extrapolated from figures in Germany and Austria. We guess that at first just bigger nursing homes are relevant. In Germany there are about 5,000 of them with more than 60 residents each. In addition, there are about 2,000 hospitals in Germany. This means that there are about 7,000 potential operational environments in Germany only. Numbers for other European countries will be added in the second version of this deliverable.

1.2.4 Global trend

From a broader point of view current data and forecasting of the future market of service robots for personal and domestic use are extremely positive. The World Robotic 2013 reports a global selling of 3 million of service robots for domestic use, worldwide, in 2012. It corresponds to an increasing of 20% with respect to 2011. It means US\$ 1.2 billion in terms of value of sales.

Table 2. Some Global trend for robots for domestic services

Type of robot	2012 -2011 data	Projections 2013-2016
Handicap assistance robots and for the elderly	159 robots sold in 2012 and 156 in 2011	High potentiality due to an increasing investment in research for this technology. 6,400 units of robots sold in the period. Previsions are on a substantial increasing within the next 20 years
Robot for personal transportation	Not available data	They increase in importance
Domestic robot	1.96 million sold with a market value of US\$ 697 (+53% with respect to 2011)	15.5 million units
Entertainment robots	1.1 million sold (+29% with respect to 2011)	Not available data

Source: World Robotic 2013.

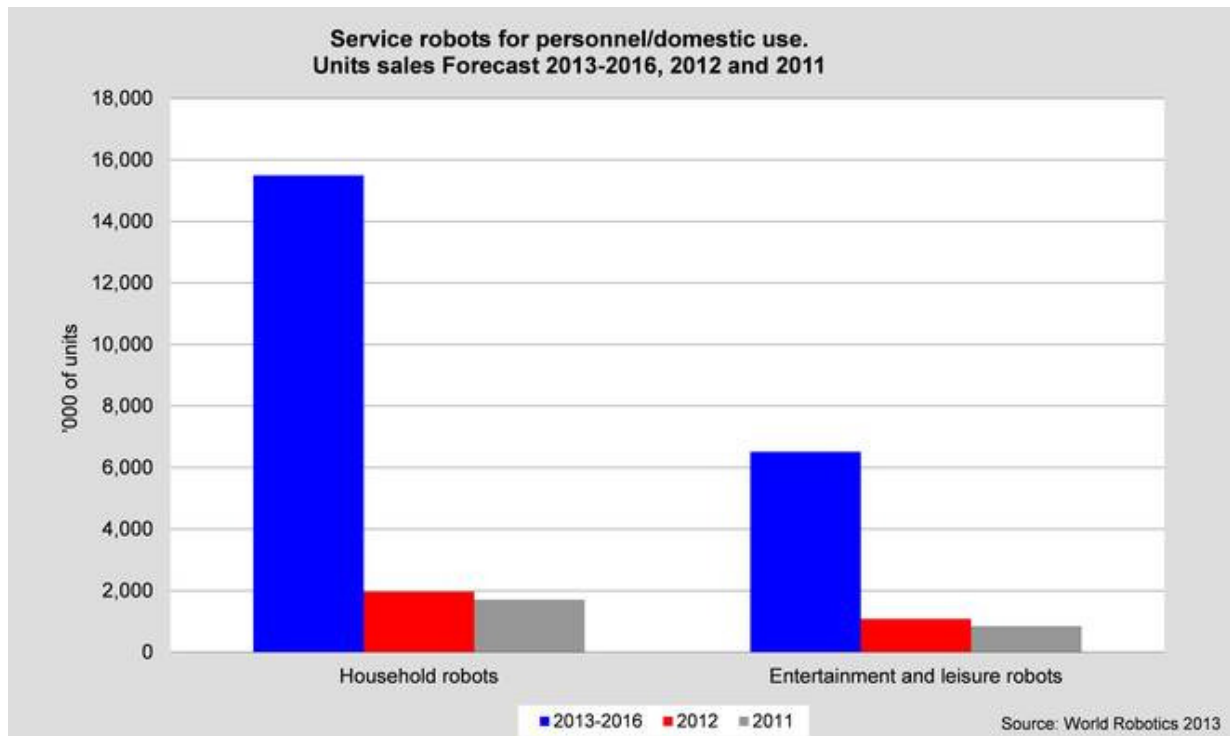


Figure 2. 2011, 2012 and 2013-2016 projection of service robots for personnel/domestic use

1.2.5 Potential Competitors

Table 3 gives some details about some competitors. One disadvantage that the mentioned robots have is the fact that they all do not provide solutions for people, who are living in houses or nursing homes with stairs. Since the market is not developed yet, and since no service robots supporting physical tasks is available yet, competitors do not really exist. To date, the task to be overtaken by Robot-Era systems are mostly carried out by care persons or the elderly themselves. Following that, competitors could also be service providers (see chapter "Selection of current Service and Business Models" in this deliverable).

A list of features, technical data and costs are given in Table 3.

Table 3. Potential Competitors

Robot	Technical data	Features	User group	Price
MobiNa (Fraunhofer IPA)	Mobile emergency assistant based on iRobot Create platform, programmable ⁷ iRobot Create: Controller: Atmel ATmega	MobiNa is linked with a stationary system that detects emergency cases to recognize falls. If a person fell, the system would send the spatial	Primarily elderly people in a (single) household	Actual cost: 5000 Euro (prototype stage) Later: €1KEur

⁷<http://www.irobot.com/en/us/learn/Educators/Create/Details.aspx>

Robot	Technical data	Features	User group	Price
	168 Sensors: 32 built-in sensors: IR receiver, cliff sensors, wall sensor, wheel drop sensor, etc ⁸ .In addition to iRobot Create: monitor (Tablet), loudspeakers and microphones ⁹	coordinates to MobiNa, MobiNa would drive to the person and get in contact with the emergency call centre. Other features: video conference function to remind		
Paro	Modeled after a harp seal baby Length: 57 cm Weight: 2.7 kg Fur Coat: Synthetic, off-white color, antibacterial treatment CPU: 32 bit, RICS chip Sensors: Ubiquitous surface sensor, whisker sensor, stereoscopic optical sensor, microphone for voice recognition, temperature sensors, posture sensors Actuators: Eyelid (2), Upper body (4), Front paw (2), Hind-limb (1) Battery: nickel hydrogen cell Loudspeaker: for simulating realistic sounds of the harp seal ¹⁰	Diurnal rhythm of morning, daytime and night 5 different sensors for perceiving people and its environment: light sensor: to recognize light and dark tactile sensor: to feel being stroked and beaten audio sensor: recognition of voice direction and words posture sensor: to feel being held Paro can remember his social contacts and can adapt it Imitation of the sound of a real baby harp seal Expresses his emotions/feelings through noises, motions and facial expressions. Responds as if its alive ¹¹	Primarily (elderly) people with, for example, diseases like dementia ¹²	€5,7 k no subsidies from nursing care and health insurance companies, previous renting and leasing offers only for commercial customers (for example nursing homes, ambulance services)
Giraff (Excite)	Technology: Giraff robot, produced by Giraff Technologies AB in Västerås including <ul style="list-style-type: none"> • Charging station • Keyboard and mouse • WiFi interface • Remote control for residents to answer and initiate calls on the Giraff • Unlimited number of visitors and visits • Unlimited number of Pilot downloads • Unlimited access to Sentry, the database used by care organizations to manage and configure Giraffs and visitors • Licenses and support for two years • software upgrades for two 	Foster social participation of elderly persons Mobile Tele-presence device: caregivers, friends, family can virtually visit a home, move about freely and are able to communicate with residents via videoconferencing ¹⁴	Elderly people in a (single) household	

8http://www.robotadvice.com/irobot-create_specification.html

9http://www.ipa.fraunhofer.de/Mobiler_Notfallassistent.2206.0.html

10<http://www.parorobots.com/pdf/pressreleases/PARO%20to%20be%20marketed%202004-9.pdf>

11<http://paro.jp/english/function.html>

12<http://www.beziehungen-pflegen.de/>



Robot	Technical data	Features	User group	Price
	years • 24-hour phone and email support ¹³			
Giraff plus	Technology: Giraff robot, produced by Giraff Technologies AB in Västerås(see above) also including: environmental and physiological sensors for context recognition and activity monitoring	Mobile Tele presence device (see above) also including: network of sensors on the body too for measuring blood pressure or detect if somebody falls down, etc. ¹⁵ opportunity for pre-selecting different services to requirements of older adults and health care professionals	Elderly people in a (single) household	

When referring to care institutions, the competitors are actually human employees – which leads to the need for ethical discussions about the potential replacement of these. With the developing shortage of nursing staff, this issue might be solved – but more research is needed on this topic.

In general the services described above compete with manual work that will be charged with 10 to 30 € per hour. In some cases, the robot also competes with static or portable devices, like a standard water dispenser, tablet PC or TVs (entertainment). The first tele-presence vehicles already exist, e.g. Giraff, VGO and QB, but they are limited to tele-presence and have so far no autonomous driving possibility.

The developed mobile robot is a unique human-machine-interface that can autonomously drive to the end-user and proactively offers several services. Thereby, simple tasks and routine job can be done at lower costs.

14 <http://www.oru.se/excite/>

13 <http://www.giraff.org/professional-caregivers/?lang=en>

15 <http://www.giraffplus.eu/>

2 Definition of Robot-Era Services

The selection of Robot-Era services is based on the work in WP2 and the technical feasibility (WP4, WP5, W6). To sum up, the following services will be provided for the first experimental loop:

- Drug and shopping delivery;
- Garbage collection;
- Communication;
- Surveillance;
- Food delivery;
- Laundry;
- Reminding;
- Indoor escort at night;
- Object transportation;
- Walking support;

The following analysis of Robot-Era service, business and marketing models will refer to those services¹⁶.

3 Methods and Strategies for Service, Business and Marketing Models

There are different approaches to the definition of a business model for services (Amit and Zott, 2011, 2012; Zott, Amit and Massa, 2011, Morris et al. 2005, Shafer et al 2005, Tikkanen et al., 2005). But all of them share the idea that a business model integrates different and heterogeneous and interconnected elements focused on the new service/product and the external and internal organization changes the service proposed needs. The business model goal is to achieve a long-term success.

With respect to this target, a business model can be defined as "a concise representation of how an interrelated set of elements – the offering, relationships, resources, revenue model and management mind-set—are addressed to create and capture value in defined markets" (Rajala and Multanen , 2009).

The main dimensions of the business model focused on a service or a system of services are:

- 1) Resources: the accumulate tangible and intangible knowledge that can be used to offer the service. The logic behind the system of available resources are traditionally focused on tangible assets for goods, and intangibles for services (Vargo & Lusch, 2008). However it will not the case for Robot-Era services where both tangible (robotic technology) and intangible resources logics have to be considered.
- 2) Offering i.e., the proposed service;
- 3) Relationships i.e., the system of internal (with the organization of the service provider) and external stakeholders involved in the services and the set of information shared.
- 4) Revenue Model i.e., the system of costs and prices (and it is because it is strongly related to marketing) and the strategies to increase value from the solution proposed. It tries to answer to questions such as how does the business produce and capture value? What are the main revenue origin?

16 For a detailed description of all services see D8.1

- 5) Mindest: the system of intangible elements achieved by the service provider and embedded in then services.

3.1 Methods and Strategies for service models

The above are element of a traditional approach to design service models as a basis for the marketing and business model. This approach usually considers final user needs, habits and then it designs a solution that has a competitive advantage with respect to current ones. Marketing and business models are then built on the product.

This traditional approach cannot be applied here because of:

- 1) the complexity of the technology involved;
- 2) the new organization of activities and responsibility of the stakeholders involved if the new models are implemented;
- 3) the need for a clear and demonstrable non inferiority of the new services with respect to the current ones.

All the above points can be considered inputs for the last one. The need for a clear and demonstrable non inferiority of Robot-Era services originated by the nature of the services that also consider health related activities where public sectors and public health institutions can be involved. For these institutions, one of the criteria for introducing or investing in the adoption of robot services is a demonstrable non inferiority of the solution proposed with respect the current services.

It means that the analysis of non inferiority is not only an internal tool for business and model design but it is also a formidable marketing strategy for increasing the probability of service adoption.

The novelty of the approach for measuring the impact of the new services is to adopt the methodology of cost-effectiveness analysis, used for assessing new healthcare programs and technologies.

The scope of a cost effectiveness analysis¹⁷ within Robot-Era services considers a comparison between effects and costs of current and new services.

Effectiveness is evaluated considering the benefits and satisfaction represented by the increasing utility (also considered as added value, acceptability and willingness to pay) of the new services for the stakeholders involved. Costs are related to direct and indirect financial inputs and outputs and resource consumed.

Utility and costs that are relevant to be measured differ among the service stakeholders.

Table 4. Added value of services from different perspective

	Final user	Private Payer	Public Payer
What is the added value of a service?	It is related to the improvement of quality of life	It is the revenue derived by differences between costs and returns that depend on final users' additional satisfaction	It is the added value derived by satisfaction of social and relevant needs
What is the willingness to pay?	It is a proxy of the perceived utility of the new service	--	It is the cost effectiveness gain due to the introduction of new services

17 We give just some indications of the cost-effectiveness approach related to Robot-Era project. For a general introduction of cost-effectiveness methodology in health see Drummond et al. 2005(third edition).

The cost effectiveness analysis of Robot-Era services has been designed considering the following stakeholders:

- 1) municipalities;
- 2) service providers;
- 3) family and principal caregivers;
- 4) final users.

For the analysis of how stakeholders A and B are involved in the current service delivery we have designed an ad hoc questionnaire with several open questions. This questionnaire has been considered a structure for direct interviews.

For the analysis of stakeholders C and D we have designed questionnaires divided into a general and a service specific questionnaires.

Final users will be also divided into two groups of final users of current services (D1) and users of Robot-Era services (D2). Following the sample dimension involved in the technical experimentation of the project i.e., 35 final users in Peccioli and 35 in Örebro, the sample of final users involved for the cost-effectiveness analysis should be the same.

As reported in the description of the preliminary test done by the technical units of the project, people currently involved in using Robot-Era services have been selected considering their psychological attitude and level of mobility using a standardized questionnaire.

The first sample of final users that tested the robotic services is now 8 units in Peccioli. It means that a cost effectiveness analysis cannot be performed yet, but it will be finalized when all the 70 final users will be actually involved in testing Robot-Era services.

Cost effectiveness differences will be measured comparing data from samples D1 and D2.

In Peccioli, the 8 units of final users that are currently testing a small sample of Robot-Era services do not come from the 47 final users of current services.

So we will not compare the experience of D2 with their past experiences (within groups by comparison will not be available) but only differences among groups will be performed.

3.2 Methods and Strategies for Business Models

A business model is a description of the strategies that are able to convert an innovation into value through a valorisation of the competitive advantage generated by innovation of product and service. In short, it consists of four macro arguments that in case of Robot-Era services, are¹⁸:

18 It is not the case to consider the general theory behind a business model in its original definition: "the determination of the basic long-term goals and objectives of an enterprise, and the adoption of courses of actions and the allocation of resources necessary for carrying out these goals" (Chandler, 1962). Here we indicate inputs for conducting a business model that has the scope of a implementation and commercialization of services designed in Robot-Era. In a strictly sense, however, we cannot divided the effort to design new service model and business models since a good service model need a business model, and vice versa. They are parallel activities that use mutual indicators and variables to improve the quality of the services and the financial system the support them. For a short description of the components of a business model see appendix 1.

- 1) how to get profit from the innovation of services, also considering the relationship with potential competitors;
- 2) how to organize the management of the services;
- 3) which kind of relationships with suppliers;
- 4) how to measure the internal and external performances related to the services.

Decisions on points 1-4 should be oriented also considering the detailed program of potential costs and forecasted revenue associated to a product or a service through the business plan.

To evaluate potential costs and potential revenue of Robot-Era services, and designing the best business model for the services, one should consider the following interconnected points:

1) market size, characteristics and future trend in terms of:

- a) characteristics of the current and potential demand for comparable services and products: trends in elderly population, their increasing relative size among population, the composition of families, their needs, increasing problems on mobility associated to different pathologies, ICT diffusion trend among over 65s, etc. General data are available from studies on elderly population and the analysis of final users of current services within Robot-Era;
- b) previsions on the diffusion rate of the services that depends to:
 - i)* the competitive advantage, also measured in terms of cost-effectiveness;
 - ii)* average price of comparable services in the market, data available from current the analysis of the supply of similar products or services;
 - iii)* entry barriers, that increase as the weakness of the Robot-Era services emerges in all the characteristics associated with Robot-Era solutions that are worst than the current ones. Relaxing these weaknesses is the effort of the technical unit of the project and the unit employed to design effective and efficient marketing strategies. These elements are useful to design scenarios of service market penetration also indicating the producers and times requested to achieve a particular market share.

2) Productive capacity over time: number of robots and services that can be implemented over time.

3) Price of the services and or products he or she wants to and should sell, according to:

- a) willingness to pay of final users and other stakeholders if they co-pay the services;
- b) the definition of services model and the marketing strategies adopted;
- c) fixed and variable production costs;
- d) mark-up added on the production costs: i.e., unit revenue;
- e) productivity and costs associated to the production of services and decisions to make or buy parts of the products, technology, activities.

So in its financial components, a business model should also consider a business plan to evaluate the financial sustainability of a program that involved product and or services, presenting a forecasting balance-sheet related to the services.

To design a business model also means acting on the indicated variables, modifying and playing with the values among values, relaxing some hypotheses and assumptions on future scenarios that can be considered closest to reality; looking for the best mix that makes the project sustainable among time. Sustainability means an increasing trend of demand for the

services, at a price that guarantees good cash flows able to compensate initial costs and is useful for sustain future production of services.

A first useful tool to evaluate the Robot-Era future sustainability is the definition of the break heaven point (BHP) i.e., the minimum quantity of Robot-era services one have to sold at the defined price to compensate costs, and, according to the previsions and productive capacity, time necessary to achieve BHP.

For instance let FC and VC fixed (e.g., robot) and variable costs, respectively. Let also n the number of potential services, p their unit price, and let also P(n) the production capacity, I.e., the annually number of services that can be delivered according to the technology.

It is easy to show that the number n* of services that compensate the production costs is given by:

$$n^* = FC / (p - VC)$$

that can be achieved after n*/ P(n) years.

A complementary and useful measure can be done considering unit price as the unknown variable and adding the mark-up M.

$$p^* = VC + FC/n + M$$

Given a prevision on future selling, one may look for the unit price of the services able to balance costs. If price for Robot-Era services is too high than the final user willingness to pay or with respect to the average price for current services, than the probability of Robor-Era service diffusion will be very low without a good marketing strategies or a different co-payment regime¹⁹.

Then, considering the forecasting balance-sheet for the service, it is possible to measure the profitability of the initiatives using traditional indicators of investment performances such as the return on investment ratio (ROI).

3.3 Marketing Models

The following paragraphs will discuss theoretical assumptions in the field of marketing needed for the creation of the Robot-Era marketing model. For that, an overview of current strategies and methods for developing an integrated marketing model will be presented. The selection of theoretical input is based on the current development of the Robot-Era platform and the current market situation in service robotics.

The marketing process can be divided into different steps²⁰:

Understanding of market and customer desires;

- 1) Creation of a customer oriented marketing strategy;
- 2) Development of an integrated marketing program.

19 For instance, just considering the system of current services in Peccioli, and anticipating a result of the empirical analysis, we can indicate a range limit for hourly p1 for the services in the range: 4€ - €12, under the hypothesis that the demand for Robot-Era services will be similar to the demand for current services.

20 Kotler et al. (2011) also describes the necessity of "Building up profitable customer relationships" and of "Obtaining customer values". For D9.2 the focus will be on the presented three dimensions mentioned above, because the end product (the three Robots) are not ready to integrate into the market. For that reason the last two dimensions of the marketing process will be left out at this moment and will be part of the next Deliverable for RobotEra Service, Business and Marketing Models (D9.4).

To understand the market and customer desires a user oriented analysis has been carried out in WP2. Also stakeholders like **insurance agencies**, care facilities, **caregivers and relatives** or family members of users (elderly people) will be considered during the marketing analysis²¹.

The basis for a customer oriented marketing strategy will be the research input from WP2, which includes all results of the workshops, interviews and focus groups. One way to gain an understanding of potential costumers is market research. For Robot-Era a set of qualitative (e.g. focus groups, interviews) and quantitative (e.g. UTAUT questionnaire) methods of market research has been used²².

Following state-of-the-art theory, four different directions of marketing management can be distinguished:

- 1) the production oriented;
- 2) the product oriented;
- 3) the sales oriented, and
- 4) the marketing oriented management (Meffert, 1994).

For Robot-Era it was decided to rely on the marketing oriented strategy, meaning that the real user requirements were collected before the start of product development. All Robot-Era services were based on user requirements, which were expressed by potential users of the robots during workshops, interviews, and focus groups.

In general the Robot-Era marketing is oriented on a *social marketing approach* (Aras, 2011), which means that Robot-Era Services were based on the assumption of improving the quality of life of elderly people and therefore force society trends in a positive direction (e.g. compensate vacancy in the sector of elderly care by giving elderly people more independency in activities of daily living).

Accordingly the Robot-Era marketing will offer a social and sustainable approach, which will not only include the current needs of today's elderly but will also focus on upcoming generations of elderly in the future.

3.3.1 Understanding of marketand customer desires

To understand customer and market desires, and to use these as a basis for developing a marketing approach, the understanding of basic theories on user needs and customer satisfaction is useful.

The probably best-known theory in this field is Maslow's hierarchy of needs (Maslow, 1943). This theory is often described in the shape of a pyramid with the most fundamental levels of needs at the bottom and the need for self-actualization at the top level. The most fundamental and basic four layers of the pyramid contain what Maslow called "deficiency needs": esteem, friendship and love, security, and physical needs. If these "deficiency needs" are not met – with the exception of the most fundamental (physiological) need – the individual will feel anxious and tense. Maslow's theory suggests that the most basic level of needs must be met before the individual will strongly desire the secondary or higher level needs. An implication for robotics can be, that the relevance of the upper levels (e.g. esteem and self-actualization; or in the regard of robotics ethical and image issues) is low, as long as the needs on lower levels (e.g. physiological and safety) are not fulfilled.

Another well-known theory is the Kano model, which classifies customer preferences into categories: threshold (fulfilment of basic needs), performance (fulfilment of expected needs) and excitement (unexpected by customers, but leading to a high level of

21 The analysis of requirements of other stakeholder groups besides elderly people will be conducted in D9.4.

22 For a detailed description of social research activities please see the deliverable submitted for WP2.

satisfaction). Following this theory, a competitive product meets basic attributes, maximizes performance attributes, and includes as many "excitement" attributes as possible at a cost the market can bear.

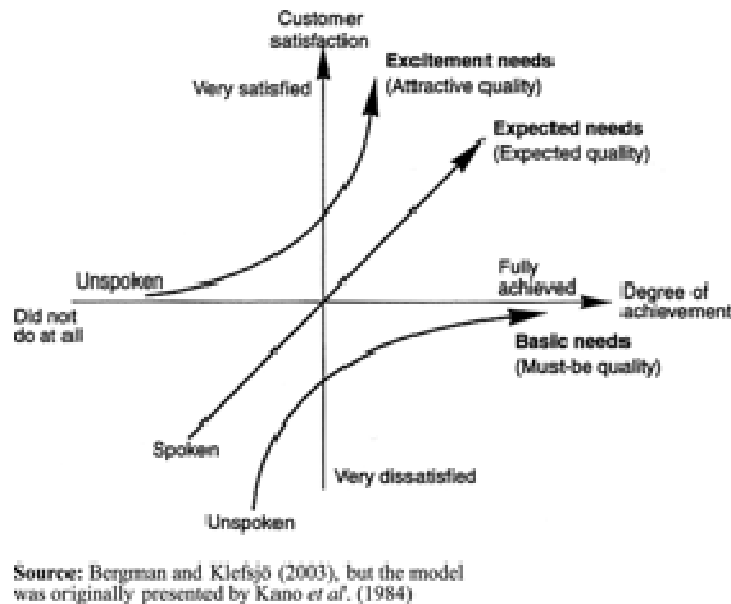


Figure 3. Customer satisfaction and degree of achievement

Already these two theories show how complex marketing can be – with a wide variety of user needs on the one hand, and a complex system combining a high-tech product (the robot) with several services, influencing the consumer benefit and satisfaction.

Even worse, the needs described by the models of Kano and Maslow are overlaid by individual external and internal factors, e.g. by the social environment, the housing situation, the economical situation, the life style, education and interests and many more.

Another relevant theory in the field of marketing is the "diffusion of innovations" (Rogers, 2003). This theory explains, how new technologies spread through user groups and cultures. It shows the process by which innovation is communicated, using different channels over a period of time. The theory distinguishes between five groups, that adopt the innovation consecutively: The "Innovators" (about 2.5% of all adopters), the "Early Adopters" (13.5%), "Early Majority" (34%), "Late Majority" (34%) and "Laggards" (16%).

Since service robots are not yet sold on the market, the remarks given in this chapter apply mostly to the Innovators and to the Early Adopters. E.g., most recommendations given on marketing and distribution refer to means that presumably work well for these early adopter groups.

To facilitate the complexity of marketing, specific target groups have to be identified and described, even though no user ever would exactly fit into one of these target groups. But the "standardization" of customer desires via the definition of target groups helps to strategically plan the positioning and an integrated marketing program for these groups.

By defining specific target groups the "Consumer Benefit" and "Customer Satisfaction" can be demonstrated to describe the unique selling proposition of a robot.

To distinguish between "Consumer Benefit" and "Customer Satisfaction" two definitions will be given:

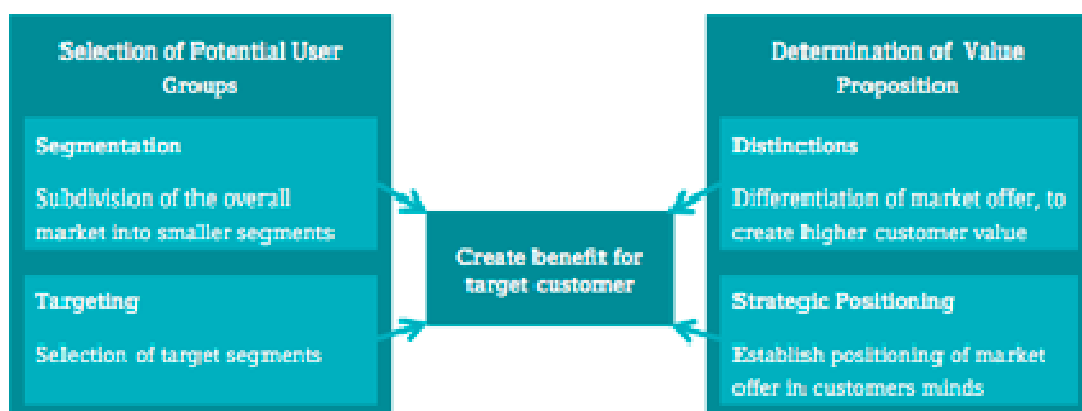
- 1) Consumer benefit** is the difference between all costs and benefits of using a product compared to competing products from the users perspective. (Kotler et al., 2011) p. 69)

- 2) **Consumer satisfaction** is the perceived product performance compared to the users expectations towards a product. If the product performance is lower than expected by the customer, the customer probably will be dissatisfied – does the performance correspond to the customer’s expectations the customer will be satisfied. (Kotler et al., 2011, p. 69).

To understand which factors can influence the consumer benefit and consumer satisfaction, not only the product itself should be put into the centre of analysis, but also the services and immaterial components around the product.

3.3.2 Creation of a customer oriented marketing strategy

To create a customer oriented marketing strategy the definition of target groups and strategic positioning of the product (here the robot) will be necessary.



(Kotler et. al ,2011, p. 454)

Figure 4. Creating benefit for target customer strategies

3.3.3 Segmentation of market

Segmentation is a compromise between assumptions of mass marketing, which treats all people in the same way, and the opposite, that every person needs an individual solution. Target group oriented marketing takes into account different needs, perceptions and consumer purchasing behavior. Furthermore a target group oriented strategy means:

- 1) Identification of market segments;
- 2) Selection of one or more segments
- 3) Formulation of an appropriated marketing mix.

Target group marketing makes it easier to identify and develop sales opportunities, to develop suitable products for each target market and to match the price, distribution path and advertisement for the target market. Besides a differentiating marketing creates more turnover than a not differentiating marketing strategy (Allenby, 2002).

There are different ways of consumer goods market segmentation:

- 1) demographically (e.g. age, gender, income);
- 2) geographically;
- 3) geo-demographically (e.g. regions, countries);
- 4) psycho-graphically (e.g. lifestyle, class);

5) behavioral segmentation (e.g. expectations, frequency of use, attitude towards technology).

For the description of the Robot-Era target market those segmentation criteria's have to be considered. But at the same time it has to be clear that a segment loses attractiveness if there are already some strong and aggressive competitors as well as if there are current substitutes existing, which cut the price margin and the expected profits forecast.

Also the strength of the consumer is important regarding the undercutting of prices, higher quality, performance or for expecting services for the same price and to play off against competitors. One challenge of creating a marketing model is to adjust the strength of a product and market opportunities or rather segments. For that it is important to identify a customer group from which point of view the product offer could generate the highest and differentiating benefit compared to other competitors. After that the offer need to be established in a position in the minds of costumer.

The key to success is to produce the highest benefit and to understand the needs of potential costumer better than other competitors. This could be done by presenting an inexpensive offer or by generating a higher benefit than others to justify higher prices.

The distinction also depends on the branch. The Boston Consulting Group Matrix is a tool to categorize a product or service depending on market growth rate and the relative market share. Depending on the distinctness a product can be classified as a question mark, star, dog or cash cow. Service robots can be classified as "Questions Marks" because the market until today can be described as low but the expected market growth is high.



Figure 5. Boston Consulting Group Matrix²³

3.3.4 Strategic Positioning

Positioning means the way a product is perceived by the costumer depending on certain product characteristics (e.g. Jaguar = luxurious; BMW = sportiness). (Albers, 2007).

To produce a competitive advance the perceived product characteristics should correspond to the positioning of the product. The positioning is an extensive set of emotions, feelings and impressions, which a consumer unites to a product in comparison to other products.

There are different **strategies for a successful positioning**:

23 Source: Tanner and Raymond (2010): Principles of Marketing, Flat World Knowledge Inc., Paperback.

- 1) To consolidate the current position (e.g. Avis Care Rental is the second largest rental company and they advertise themselves with the slogan "We're number two – we try harder.");
- 2) the same time, which was a new invention in the field of hair care);
- 3) To reach a repositioning (e.g. Made in Germany, once was a label introduced by England to act as a deterrent- today Made in Germany is label which stands for quality, cf. Ries and Trout, 2000).

During the creation of a marketing model for Robot-Era a new positioning strategy has to be developed. To **select a positioning strategy** it is important to identify **competitive advantages** about:

- 1) Distinction through the **product**;
 - a) Optional features;
 - b) Performance;
 - c) Design and appearance;
 - d) Product benefits;
 - e) Intended use;
- 2) Distinction through services;
 - a) Montage and putting into service;
 - b) Maintenance and repair;
 - c) Trainings and consulting;
 - d) Promptness of services;
- 3) Distinction through employed models for n different service currently delivered, but an integrated system of services;
- 4) Distinction through the image (symbols, logos with a high recognition factor);
- 5) Positioning through a cult (e.g. cult like "Hello Kitty");
- 6) Positioning through the origin (e.g. country of origin).

There are two different opportunities to highlight competitive advantages – the **Unique Selling Proposition** and the **Emotional Selling Proposition**. The Unique Selling Proposition (USP) means to develop one unique selling proposition for one brand and to keep this proposition constant over the time. A company promotes itself through these different qualities like best quality, best service, best price or innovative technology.

The Emotional Selling Proposition (ESP) means to increase emotional preferences and associations regarding the uniqueness of the product (Kotler et al., 2011).

3.3.5 Development of an integrated marketing program – Marketing-Mix

Following the steps for a marketing strategy mentioned in paragraph Strategies and Methods for Marketing Models (YOUSE), the next step is to define an integrated marketing program, also named Marketing-Mix (Zollondz, 2008). Neil Borden introduced the term marketing mix during his speech at the American Marketing Association in 1953 and Jerome McCarthy suggested the actual four Ps (Mynatt, 2009).

Accordingly this will be an operative action during the marketing process including a closer look on the product, the price, communication channels (promotion) and distribution (place) processes (see Figure 6: Marketing-Mix).

Illustration of YOUSE GmbH based on Bruhn, M. (2004)

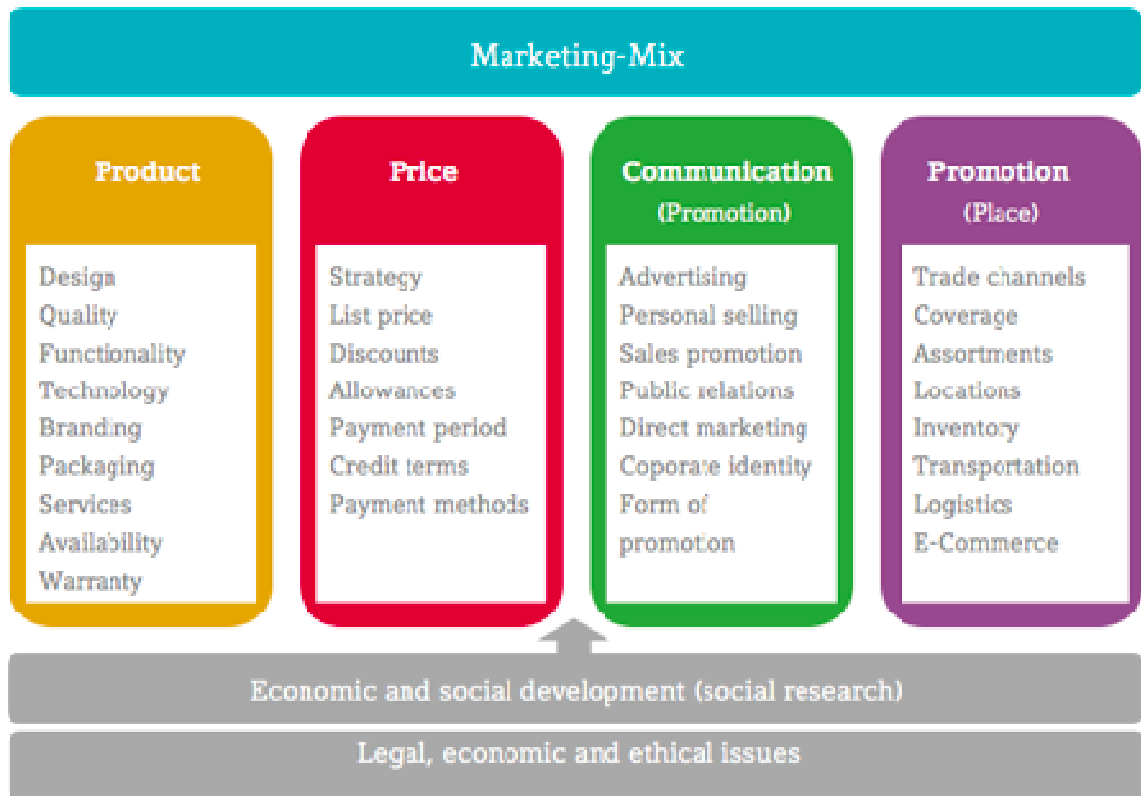


Figure 6. Marketing-Mix

Relevant questions occurring during this phase are:

- 1) How precise should the target group be divided into different segments?
- 2) How should the relation between product, price and strategic positioning be arranged?
- 3) What should be the estimated marketing budget? And how should the budget be distributed between different marketing instruments?
- 4) Which interaction effects between different marketing instruments (or different products) should be taken into account?
- 5) When taking a look on the different elements (product, price, distribution, communication) of the Marketing-Mix – more detailed questions appear. The following paragraph shows general guiding questions, which should be used for the creation of an integrated marketing program.

3.3.6 Product

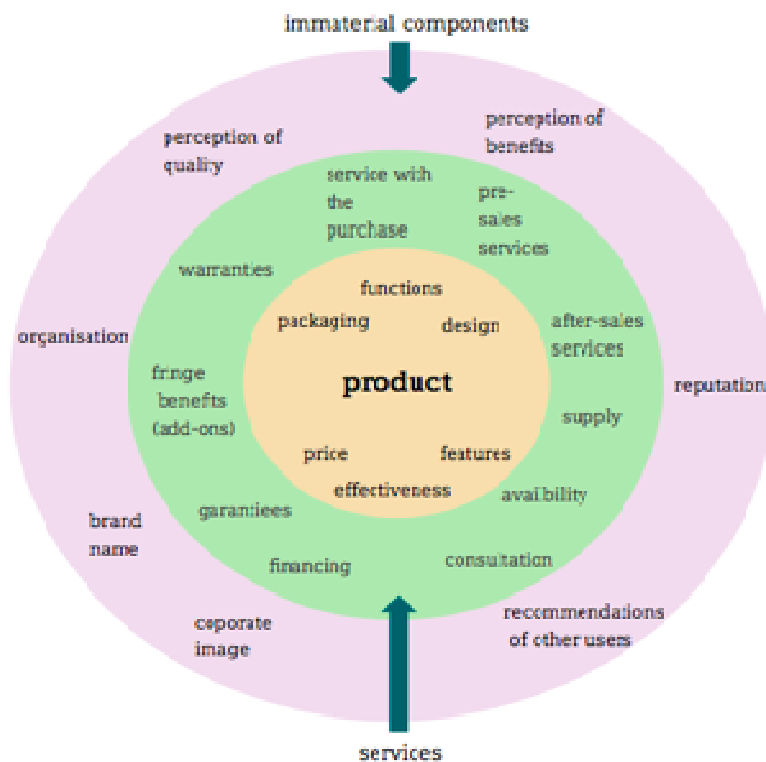
The category "product" includes a clear brand policy, positioning, modification, extension, design, packaging etc. and follows the questions:

- 1) How *should the product program* be developed in detail?
- 2) For which quality level the products should stand for?

- 3) For which kind of innovation do the activities aim?
- 4) How should the brand be structured and positioned?

Talking about “the product” does not only mean the physical aspects but also intangible characteristics. Thus a product innovation can be defined “as an idea, a product, a service or a technology for sale which is perceived as new by a customer.” (Kotler et. al (2011), p.672). During the product development the new customer benefit will be identified or created.

Customers tend to see a new product as a bundle of benefits. The question a marketing concept should face this to sum up the main needs and define the customer benefits based on the product innovation. Figure 4 shows the different dimensions of a product and the weight of the perception of the customer. Besides the **core product** standing out for the core user benefit and the **real product** (including e.g. packaging, brand, product design, product quality and functionality) there is the **extended product**(including e.g. services, guaranties and trainings).



Source: Mc Donald (2008)

Figure 7. Dimensions of a product

3.3.7 Price

Price is the most important factor regarding the positioning of a product on the market and the product development. This category of the marketing-mix contains pricing per product group related to different market segments.

Important questions are:

- 5) Which positioning strategy should be implemented with respect to competitors?
- 6) How should the relation between cost, competitor prices and customer benefit be weighted?

- 7) How should price differentiation carried out in detail (what extent and criteria)?
- 8) To what extent and criteria customer discount should be given?

For nations with lower incomes, poorer households and particularly in case of standardized products the price is still the main buying decision criteria. On the one hand the price is the only element of the marketing mix that is related to the turnover whereas other elements e.g. communication or distribution are producing costs. On the other hand the price is the most flexible element of the marketing mix but at the same time the most risky one.

In many cases the price is adjusted downwards to increase the sale, but by doing so it misses to create a personal value for the customer and to bring a reasonable price in the mind of the customer. So the aim of pricing is to create a value for the product and not only a mathematical model related to the costs. That means to check and change the price situation constantly depending on current market changes and to involve different elements of the marketing mix at the same time. Pricing also assumes knowledge about different competitive products, about target groups and the situation of buying a product.

Principle variables regarding the price decision are:

- 1) The maximum price limit:

The perception of the customer regarding the personal value of the product.

- 2) The bottom price limit:

Covering all material costs regarding the production of a product.

- 3) The perception of the customer regarding product price and value:

An efficient and customer oriented pricing needs to estimate how to attach a certain value to the customer and how much weight this value has in the customers mind. With this value one is able to assign an accurate price depending on the personal value of the customer.

- 4) Value oriented pricing:

The price depending on the perceived product value. For its calculation the reasons of buying a product should be known in detail and regarding this reasons and personal values of the customer the price should be determined. The decision of buying a product depends strongly on the value a customer is attributing to particular product functions. Depending on the circumstances different pricing strategies for different target markets are appropriate. (cf. Herrmann, 2003). There are two main **pricing strategies**, the Good-value-pricing strategy and the Value-added-pricing strategy.

- a) **The Good-value-pricingstrategy** combines the quality of a product and a good service to offer the product at a fair price. For that an **Everyday-low-pricing strategy** (e.g. Wal-mart, IKEA), or a **High-low-pricing** with special offers for a lower price can be appropriated.
- b) To apply a **Value-added-pricing Strategy** it is needed to enhance the product value by adding secondary services. Those secondary services are useful to justify higher price ranges. The aim of this strategy is to maintain or to increase the value of the market offer.

Besides the perceived value of a product in the eyes of the customer and, the pure product costs are an important factor of pricing, too. An useful instrument for calculating the purely product cost is a **Break-Even-Analysis**. This method aims at a profit-oriented strategy and describes the break-even point. (McDonald , 2008, p.427 et. seq.).

3.3.8 Communication

“Communication” describes the approach how to communicate to the customer with regard to different areas e.g. advertisement, sales, sales promotion, public relations, fairs, direct mailing, call centre or internet. Questions to focus on are:

- 1) Which communication aims and target groups should be focused?
- 2) What should be the estimated budget for communication activities? And how should the budget be distributed for different communication instruments?
- 3) Which product characteristics should be highlighted during the communication?
- 4) How should the success be measured?

3.3.9 Content of communication messages

To create a good marketing message to be communicated to the customer it is recommended to follow the “**AIDA scheme**”. That means to formulate a message to gain **Attention, Interest, Desire and Action**. (cf. McDonald 2008)

The content of a message can be formulated rational, emotional or moral. A **rational message** aims on the self-interest of target group members and should show that the product can produce the expected benefit that means to point out the quality, the performance or efficiency of the product. (Picton ,2008).

Contrary to the rational message an **emotional message** should produce negative or positive emotions related to the product. Those emotions can be e.g. love, sympathy, humor, success or joy.

To address the conscience of a person in regard of the “right” or the “wrong” is the aim of a **moral message**.

Besides the content of a message there are different considerations and questions regarding the structure of a message.

- 1) What conclusion should be drawn regarding the message? Is there a clear conclusion or should the target group be invited to draw conclusions by ones own?
- 2) How the argumentation is set up? Is there a one-sided argumentation or should the message present a balanced ratio of pros and cons²⁴?
- 3) Where to put the main argument? Should the strongest argument be presented at the beginning or at the end of the message?²⁵

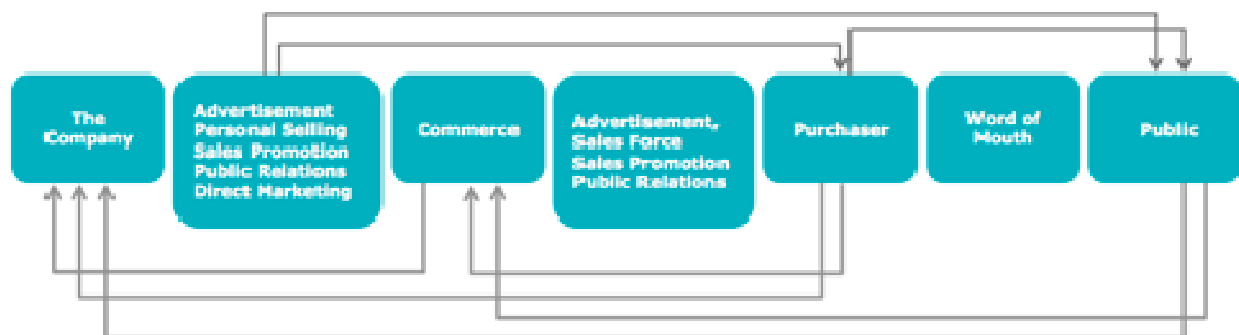
To increase the potential of perception of a product it is important to highlight the personal benefit of using a product from the users point of view. The target group should be interested in the content of the message – so the message should not only contain information on the product specifics but also evoke attention over design and creativity. Communication channels can be divided into personal and impersonal communication. Impersonal communication channels mean communication through media while personal communication can be described as a face-to-face interaction. To have a personal conversation enables an efficient communication with the target and makes it possible to gain direct feedback on the product. But at the same time the interpersonal influence

24 In general a one-sided argumentation is useful to increase the selling. But one have to be careful if the target group mainly contains individuals with a high level of education, because this target group reacts with more skepticism to one-sided detailed messages. For this group the present of some negative arguments creates a more serious image. (Kotler et al., p.809).

25 To put the strongest argument at the beginning of course creates interest, but the persuasive power is getting lower because the argumentation is dropping at the end of a message.

produces pressure on buying decisions, especially when selling expensive products like robots. In general 90% of all customers rely on consumer recommendations while only 40% rely on advertising messages (Kotler et al., 2011, p. 812). Following the paradigm of a communication-mix five instruments need to be listed (see Figure 8):

- Advertisement
- Personal selling
- Sales promotion
- Public relations
- Direct marketing



Source: Kotler et. al (2011); p.791.

Figure 8. System of Marketing Communication

Each of these instruments contains special **advantages and restrictions**.

Using **advertisement** to promote a product can reach a wide range of people at low costs. Furthermore it is possible to repeat the message several times, to give customers the opportunity to compare products. Within a good advertisement the combination between picture, sound, print and color creates a dramatization of the product, which produces interest. To create a brand image the use of advertisement is essential and can increase the sales at short-term. But at the same time advertisement is the most impersonal way of communication. The one-way-communication is not made for creating personal relationships between customers and seller. Besides international and extravagant campaigns are fairly expensive and time consuming.

By contrast to advertisement the **personal selling** follows the principle of creating personal and trustful relationships between customer and seller. Nevertheless this is one of the most expensive ways to communicate and requires a well positioned sales force.

Sales Promotion contains instruments like discount or special offers, competitions or extras generating high attention and evoke interest of purchasing. Communication instruments like this produce high personal benefit from the customer's point of view and arouse spontaneous and prompt reactions to buy a product. But this effect is not constant and for this reason sales promotion is not suitable for creating long-lasting product loyalty.

Another communication instrument is carrying out **public relations** work. Credible reports and articles are often more realistic than advertisement and were perceived as independent and objective by target groups. Even people who strictly avoid advertisement will receive the message through public relations. Similar to advertisement, reports and articles can be made in a theatrical way highlighting the product benefits.

In contrast to public instruments of communication there is the opportunity to carry out **direct marketing** activities (e.g. letters, email, online-marketing) to reach a special target group in a personal way. The customized messages can only be seen by the recipient and therefore it is immediate and with quick reactions. Direct marketing activities are a good choice to generate personal customer relationships and a target oriented marketing.

3.3.10 Distribution

Companies do often work in networks, that means every company is a part of a distribution path and linked to a supply chain. The success of one company does not only depend on the own performance but also on the distribution channel.

Distribution includes to select distribution channels and customer services. Important question for this aspect are:

- 1) Should the products be distributed directly or indirectly?
- 2) How many distribution channels should be used?
- 3) By what kind of criteria distribution partner should be selected?
- 4) How should the functions between companies and partners be distributed?

A distribution channel describes the cooperation between independent companies or organizations. This cooperation aims to make the product available for a large number of commercial customers and consumers. The distribution channel is composed of all organizations a product is involved with from the industrial production process to the final purchase by the customer (cf. Kotler 2011, p. 1003).

Members of a distribution channel have several functionalities and tasks like spreading product information, communicating with potential purchasers and networking. Also negotiations of conditions, adaptations of offers and the physical distribution of the product are important functionalities of a supply chain. Partners of one distribution channel also provide different financial resources and thus share the assumption of risk.

There are two different ways of organizing a distribution system: the traditional organized distribution channel and the vertical marketing system (cf. Frazier 1999). A **traditional organized distribution channel** composes independent producers, retailers and wholesalers in which every partner tries to maximize the profit even though their actions might evoke negative consequences for the distribution system (see Picture 6).

A **vertical marketing system** requires closer cooperation within the integrated system and compensates weaknesses of a traditional organized distribution channels by avoiding double tasks and having a strong negotiation position justified by the size of the network.

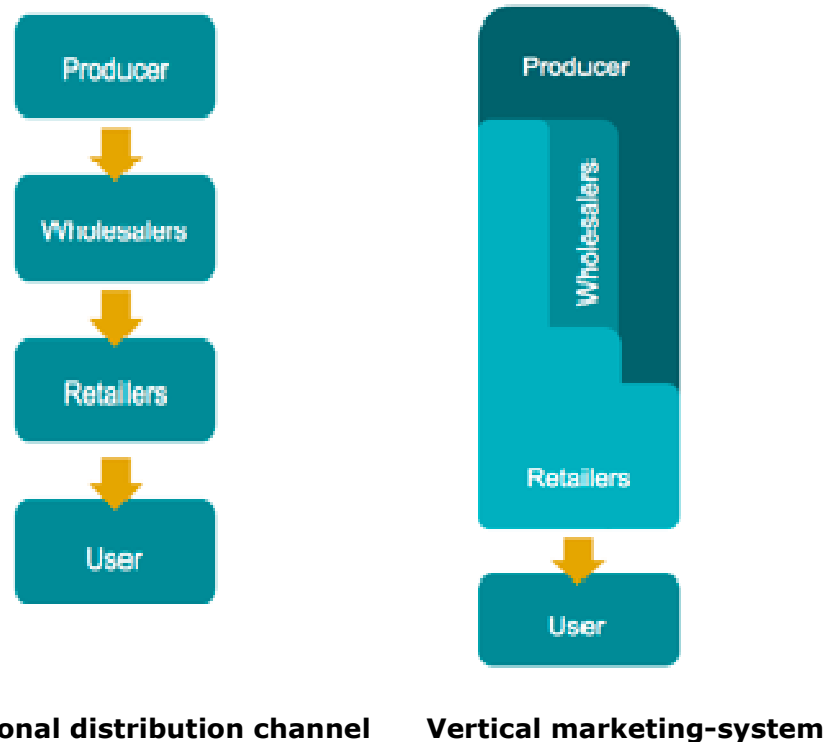


Figure 9. Traditional (left) distribution channel and vertical (right) marketing-system

One important decision regarding the distribution of a product is to decide the range of sales channels i.e. decide about the intensity of product presentation related to different markets and to decide about sales distributions (e.g. offices, stores).

There are three possible strategies:

1. **Intensive distribution.** The intensive distribution strategy aims on selling the product at many sales distributions. The products should be available for potential purchasers at nearly every time and space, to make it easier for the customer to get in contact with the product. This strategy is typical for goods like sweets, cigarettes and soft drinks.
2. **Exclusive distribution.** Exclusive distribution operates with a limited number of intermediaries. An extreme form is the concept of exclusive providers, which means that the producer has a limited number of dealerships authorized to sell the product in a restricted market area. The restrictive market behavior of this strategy promotes the exclusivity and the brand image and enables higher product pricing.
3. **Selective distribution.** The selective distribution involves some intermediaries but not every intermediary who would like to deal with the product. The effort has not be shared over several intermediaries and for that reason the producer is able to generate intensive relationships with a selected number of members of the distribution channel. Providers are able to offer good market coverage with higher influence and low costs compared to the intensive distribution strategy.

4 Description of current service and business models which can be compared with Robot-Era Services

4.1.1 Selection of current Service and Business Models

The current service model we have selected is based on the experience at Peccioli. A specific analysis for singular services is very difficult since the activities cannot be separated from each others, and there are not n different service models for n separated services but a system of strong integrated at home and outdoor activities, we have analyzed the current model of this system of services.

Up to now the available results that can be used for designing new services and the related marketing strategies come from the analysis of service providers and the Municipality. A preliminary analysis of the characteristics of final users of the current services is made on data shared by the service provider in Peccioli ("Cooperativa il Borgo").

While the analysis for singular specific current services is quite impossible, the model of services has been articulated showing the different point of views of the involved stakeholders: service providers, public co-payer, final users.

The current service model will emerge from the answers of the service provider in describing their activities, as reported below. The interview dates April 2013.

1) How many users do you serve?

44 final users served at home.

2) Which kind of users do you serve? (in terms of mobility and annual income)

This question can be divided into two sub-questions that report reasons why a final user enters and exits the service program.

2.1 Why does a final user need a service program?

Because of a reduced mobility due to chronic diseases or temporary reduced mobility because of accidents; home rehabilitation, not receiving support from relatives who live and work far from final user's home; a very reduced income to pay for private carers.

2.2 Why does a final user exits or reduces the program?

The most important reasons why people abandon the program of home care assistance are deaths, and deterioration of health (in this case people need hospitalization or night assistance usually delivered by private carers).

Reduction of weekly hours for home assistance also depends to change in family income (some final users' relatives may lose their job because of the economic crisis).

In this perspective, private carers are competitors of Peccioli service providers. However, final users usually request services from Peccioli cooperative for day care (one or two hours a day with an upper limit of 12 hours a week) and at night care from private carers. When health conditions worsen or family income decreases but final users need more and more at night surveillance, private carers are preferred with respect to Peccioli public cooperative services.

3) Which kind of services do you provide?

- a) shopping delivery;
- b) meal preparation;
- c) home cleaning and assistance;
- d) help for personal hygiene;
- e) assisted bathing;
- f) assisted dressing;
- g) reorganization linen;
- h) socialization and entertainment;
- i) outdoor chores;
- j) assisted getting in and out of bed;
- k) assisted outdoor activities;
- l) outdoor laundry;
- m) chaperone;
- n) assisted activities.

4) For each service indicate:

- a) Number and type of final users
- b) Detailed description of service phases
 - For each phase:
 - Resource consumption and costs;
 - Time consumption:
 - Number and type (skill and competence) of people involved in service delivering.
 - Hourly earnings of each type of people involved in service delivering
 - Which are the main problems of each single phase and of the service as a whole?

5) Description of services

While Robot-Era services can be divided into scenarios and activities, current services are integrated each others in a macro service. There are two models of integration: within and among services. Within service integration means that activities and phases in which a singular service is divided is irrelevant for the goal of the analysis. For instance assisted bathing may consist of a huge number of sub-activities and phases that cannot be separated and standardized and they are not useful for Robot-era and current service comparison.

With respect to division of the activities among current services there is not a way to separate actions and time since a service provider is a career or a caregiver supporting final users for one or two hours a day and during this time he or she provides a set of services without a complete separation of activities and time each service needs.

5.1 Type of caregivers and service deliver involved

A cooperative in Peccioli (service provider) employees 16 caregivers/carers. Carers do not differ in skills, competence and responsibility.

5.2 Resource consumed

Time consuming is measured in hours. Table 11 reports hours of service delivery per final user.

With respect to resource consumed (e.g., products used for apartment cleaning) they are totally paid by the service user.

Service provider costs are human resources involved in final user assistance. There are neither devices for remote monitoring of final user conditions, nor technology for a remote control and organization of caregiver activities.

Since there are not differences in competences and roles, the hourly earning is about 15€ for all the 16 caregivers.

6) Are some phases of the service outsourced? If so, which ones? under which conditions?

Services are not outsourced.

7) Service price (sell-out) and who pays?

There is not a price for singular service but hourly price for home assistance in which different services are delivered.

Final users may request up to 12 hours a week of home assistance. Services are delivered from 7 a.m. to 8 p.m. and at night in rare cases (this is because a whole night service consumes almost all hours of the service a final user may weekly require).

The co-payment scheme for hourly home assistance is represented in Figure. 9.

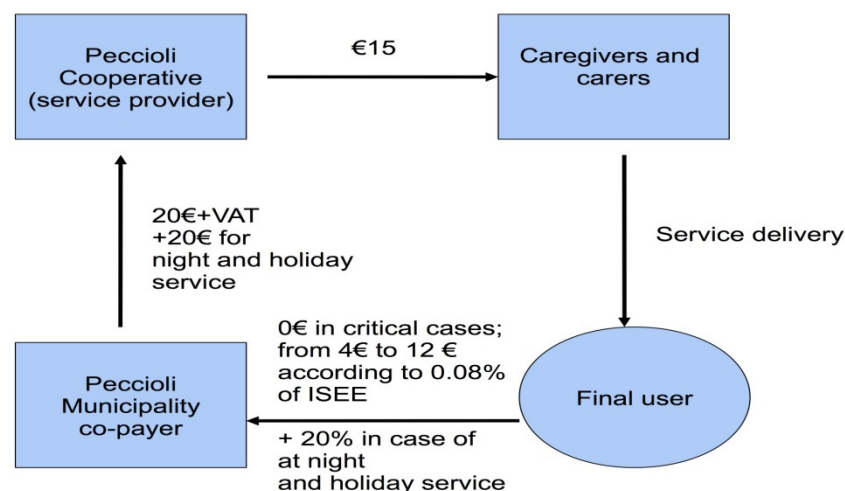


Figure 10. Reimbursement scheme for current model home care assistance

This reimbursement scheme can be considered a summary for the model of the current services.

Table 5. Average unit costs and revenue (for Peccioli service provider)

Cost variables	Day service	Service at night	Total weekly hours demanded [day + night]	Total
Unit Revenue	€20+VAT	€20+20%+VAT	312+17	€6,648.00+VAT



Unit hourly costs	€15.00	€15.00	312+17	€4,935.00
			Differences	1,713+VAT

Peccioli service provider weekly gain corresponds to 1,713+VAT.

8) According to your opinion, which is the level of satisfaction of the final user (for each service)?

Peccioli service provider registers a high level of final user satisfaction for the home assistance (of course this data may be overestimated). Final users do not request changes in quality and characteristics of services but they need more hours of home assistance at cheaper prices. In this, private carers (basically for night assistance) are competitors of Peccioli cooperative of service provider.

Final users also request (in addition to the current services) surveillance at night (this may be a positive advantage for Robot-Era services) and home assistance of medical staff and or nurses.

9) According to your opinion, which are the phases that would benefit most from the use of the robot? And Why?

(see answer to questions 11-12) Outdoor phases of shopping and laundry since they do not need a final user-caregivers too strong human interaction.

10) According to your opinion, which are the phases that will never be managed with the robotic system? And why?

(see answer to questions 13-14) E.g., assisted dressing, assisted bathing, etc, socialization and all phases that need a human interaction. According to the service providers there are also technical limits: services cannot be standardized (people may strongly differ each other), while technology is too standardized. According to service provider in Peccioli, there are some intrinsic limits for robot in assisting bathing.

11) According to your opinion, would the patient be available to pay or co-pay (and in which percentage) for the service (for each service)?

Final users actually co-pay for these services according to their income. Reasons why final users enter and exit the service program (as reported in question 2.1-2.2) may be an indirect measure of final user's willingness to pay.

12) In general: Were do you see advantages and risks regarding the effort of a service robot? (For identifying risks and barriers of using a robot in the future)

According to current service providers' opinion, robot is a potential competitor of their activities, so they do not consider robot as a complementary resource that improves the quality and efficiency of services.

13) Do you think, the use of robots through end users could have a positive effect on your business (e.g., increasing use of your services, decreasing costs, better perceived quality of services)? How could this positive effect be improved?

14) Do you have a rather positive or negative view on robots (particularly on the kind of robots planned in Robot-Era)? What important positive and negative factors do you think, should be associated to the new services?

(Answer to questions 13-14) Also considering answer to question 9, service providers say that robots may have a positive effect only for services or some activities related to one or more services that need no human interaction: e.g., the outdoor phase of shopping and garbage transportation. However the current number of people served is not sufficient to invest in robot technology. There is a sort of paradox or a contradictory behavior in the opinion of the current service providers on robotic technology. On one side they say that robot is not a substitute of human resource in service delivery for Elderly, on the other side they implicitly consider robot a risk factor rather than an opportunity for their activities and business, underestimating the complementary role of robot in helping Carers and caregivers. The financial model of the current services can be also analyzed from the Municipality point of view.

4.1.2 Current service final user description

4.1.3 Age, gender, marital status, family type

We report a descriptive analysis of 44 final users served at home.

Final users' age is near 75.29 (St.Dev.= 13.82) on average. Shapiro-Wilk normality test²⁶ for variable age indicates that the null hypothesis of normality distribution should be rejected (p-value=0.001).

Table 6. Age of final users by gender

Gender	Min	Median (IQR)	Mean (SD)	Max
male	43.00	79.00 (21.00)	74.09 (13.55)	90.00
female	46.00	81.00 (21.50)	76.04 (13.04)	93.00

There is a difference in age distribution with respect to gender. Final users male and female are 74.09, 76.94 old, respectively. Females have a significative (p-vale=0.005) higher age than males.

Table 7. Marital status by gender, frequency tab

Marital status\gender	Female	Male	TOT
divorced	1	1	2
married	5	6	11
unmarried	5	7	13
widow	17	0	17
widower	1	1	2
TOT.	29	15	44

²⁶ Among different tests for normality, the Shapiro-Wilk approach has been chosen because it is very useful in case of small samples like the number of final users of Peccioli home care services.

Table 8. Type of family by gender, frequency tab

Family type\gender	Female	Male	TOT
alone	14	6	20
with partner	3	3	6
alone with son(s)	6	0	6
with partner and son(s)	2	3	5
with parent(s)	2	2	4
other	2	1	3
TOT.	29	15	44

Widows (17; 59% of female) and unmarried (7; 47% of male) are the most frequent condition for female and male final users, respectively. With respect to family type the most frequent solution for both female and male is living alone.

4.1.4 Demand for services

The below table (Table. 9) shows the characteristics of current final users in terms of gender and their main conditions (final user type).

Table 9. Final user type, frequency

Final user type	Female	Male	TOT
Self sufficient	3	2	5
Handicapped	2	2	4
Non self-sufficient	21	6	27
Other	0	1	1
Mental disturbed	3	4	7
TOT.	29	15	44

Table 10 shows how many (%) final users request specific services.

Table 10. Demand for specific services

Service	% of people asking for
shopping delivery	38.64%
meal preparation	75.00%
home cleaning and assistance	75.00%
help for personal hygiene	75.00%
assisted bathing	72.73%
assisted dressing	72.73%
reorganization linen	70.45%
socialization and entertainment;	68.18%
outdoor chores	65.91%
assisted getting in and out of bed	65.91%
assisted outdoor activities	64.51%
outdoor laundry	63.95%

Service	% of people asking for
company	63.38%
assisted activities	65.08%

Final users' demand is about 7.09 (st.dev=3.49) hours a week for home assistance.

Table 11. Weekly hours demanded and age of final users, summary statistics

Weekly hours\age	Min	Median (IQR)	Mean (St.dev)	Max
1-5	43	83.00 (24.00)	74.20 (16.42)	90
6-9	46	69.50 (25.25)	69.64 (14.77)	87
10-12	55	81.00 (10.5)	78.33 (11.09)	92

Note that there is a U-shape of final user where picks of age are for both 1-5 and 10-12 hours demanded a week. The subsets of people that need 1-5, 6-9, and 10-12 hours a week are of 14, 14, and 16 units, respectively.

However data show no correlation (0.12 but it is not significant) between age and weekly hours requested.

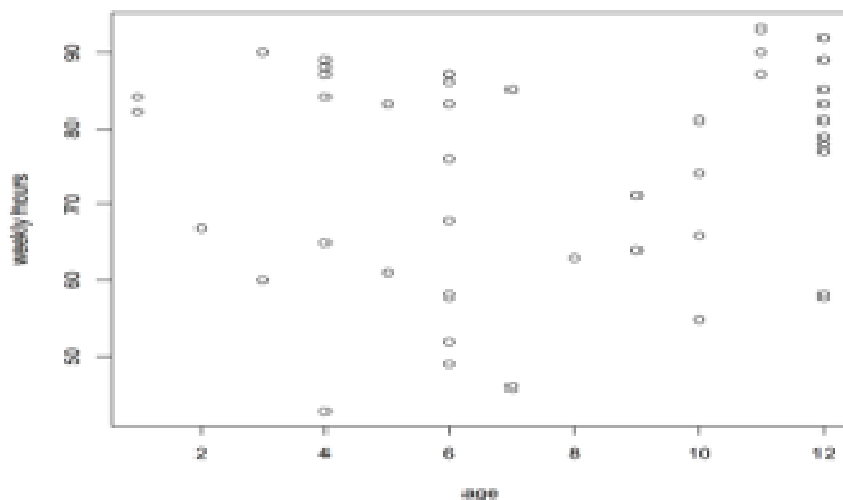


Figure 11. Age and weekly hours demanded plot

Table 12 considers the demand for services according to the main pathology of the final user

Table 12. Summary statistics for weekly hours demanded by final user's health complications.

Disease	Min	Median (IQR)	Mean (St.dev)	Max
Alzheimer	4.00	10 (3.75)	8.83 (3.13)	12.00
Behavioral disorder	3.00	6.00 (5.00)	6.33 (2.69)	10.00
Burns	6.00	6.00 (0.00)	6.00 (0.00)	6.00
Cancer	2.00	3.00 (1.00)	3.00 (1.41)	4.00
Cardiovascular disease	12.00	12.00 (0.00)	12.00 (0.00)	12.00
Cerebrovascular	6.00	9.00 (3.00)	9.00 (4.24)	12.00
Cognition decay	6.00	6.00 (0.00)	6.00 (0.00)	6.00
Deforming arthritis	6.00	9.00 (3.00)	9.00 (4.24)	12.00
Depression	4.00	4.50 (0.50)	4.50 (0.71)	5.00
Diabetes	4.00	6.00 (4.00)	7.33 (4.16)	12.00
Epilepsy	10.00	10.00 (0.00)	10.00 (0.00)	10.00 (0.00)
Femoral prosthesis	4.00	4.00 (0.00)	4.00 (0.00)	4.00
Hip prosthesis	7.00	7.00 (0.00)	7.00 (0.00)	7.00
Low mobility	6.00	6.00 (0.00)	6.00 (0.00)	6.00
Lower extremity ulcers	12.00	12.00 (0.00)	12.00 (0.00)	12.00
Mental deficiency	9.00	9.00 (0.00)	9.00 (0.00)	9.00
No mobility	6.00	6.00 (0.00)	6.00 (0.00)	6.00
Reduced mobility	1.00	10.00 (5.5)	7.67 (5.86)	12.00
Senile dementia	1.00	6.50 (8.00)	6.50 (5.32)	12.00
Stroke	8.00	8.00 (0.00)	8.00 (0.00)	8.00

Table 13 shows the demand for services according to the family composition of the final user

Table 13. Summary statistics for weekly hours demanded by final user's family composition

Final user lives	Min	Median (IQR)	Mean (St.dev)	Max
alone	3.00	6.00 (5.25)	7.10 (3.01)	12.00
with partner	4.00	6.00 (6.00)	07.45 (3.56)	12.00
alone with son(s)	1.00	6.00 (6.00)	7.00 (3.56)	12.00
with partner and son(s)	2.00	6.00 (3.75)	6.21 (3.37)	10.00
with parent(s)	4.00	6.50 (4.75)	7.54 (3.16)	12.001
other	1.00	4.00 (1.00)	3.60 (1.82)	6.00

Note that the demand for hours is not strongly influenced by final user family conditions. However, as shown in Table 9, demand variance depends by the main pathologies affecting the final users. For instance, cardiovascular diseases need the upper limit of weekly hours (12).

Table 14 reports the percentage of final users that have been serving for 1-2,... 10 years according to their conditions (type).

The length of the service indicates difference (in year) between the time of the final user interview (April 2013) and the date of the first service delivered. This length has been matched with the characteristics of the final users.

Table 14. Frequency tab. (%) for service length by type of final users

Type\length of service (years)	1	2	3	4	5	6	7	8	9	10
Handicapped	11.11	0	0	0	0	12.5	0	0	0	100
Non-self sufficient	22.22	66.67	100	70	60	75	100	100	100	0
Other	0	33.33	0	0	0	0	0	0	0	0
Mental disturbed	18.63	0	0	10	40	0	0	0	0	0
Self-sufficient	22.22	0	0	20	0	12.5	0	0	0	0
	100	100	100	100	100	100	100	100	100	100

4.2 Perspective on Costs

4.2.1 Service provider's perspective

Considering 12 hours a week as the upper limit of services for a singular user, and 52 weeks a year, the upper limit of annual expenditure/revenue for assisting one final user is given in the following table.

4€ - 12€ is the hourly cost paid by the final user for services, that it corresponds to 0.08% of final user annually family wealth (in Italian: ISEE: "indicatore della situazione economica equivalente"). Service is free for final user with a $ISEE \leq € 3,000$. In the computation we have not considered management costs and home care during holiday and at night because the quantity demanded was not available.

It is very difficult to quantify the same expenditure in different countries. It is because different regimes of co-payment strongly influence the level of out-of pocket or co-paid services for the elderly.

For instance in those Countries where an insurance system of payment prevails in health, weekly costs for the services may be very higher than the case of Peccioli.

Let consider, for instance the case of U.S.A. Table 12 reports tariffs for different kind of at home assistance solutions.

Table 15. Average tariffs for at home assistance and traditional services

Care Type	In-Home Care	Nursing Homes (semi-private)	Nursing Homes (private)	Assisted Living (private)
Hourly Rate	\$14-\$24/hour	N/A	N/A	N/A22
Daily Rate	\$112-192/day**	\$181/day	\$205/day2	\$90/day**
Monthly Rate	\$3,360-5,760/month***	\$5,430/month**	\$6,150/month**	\$2,714/month2

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

Source: 2012 Genworth "Cost of Care" Survey.

As shown in Table 15, the interval \$14-24/hours for in-home care are comparable with Peccioli costs but with the total costs for the Municipality. However it is higher than the quote paid by final the user.

Let consider the monthly rate for in-home assistance reported in Table 15 (from \$3.360 to 5,760), as compared with the monthly cost paid by a final user in Peccioli (5,31). In case of Peccioli, and considering the higher tariff for a final user (€12) and the upper limit of hours that one can ask for (12), the Monthly rate is €573. Municipality would pay €960 for singular final user. They are prices very small with respect to values indicated in Table 15.

The following table (Table 16) presents a theoretical exercise considering the upper limit of demand for day services asked and the related costs and revenue for different stakeholders. Actually demanded and actually annual profits are also indicated. The upper limit of annual profits or costs has been computed considering an upper limit of 12 hours a week, 52 week a year. The actual annual profit has been computed considering the effective 312 hours a week demanded (April 2013). The annual profits for Peccioli cooperative of service providers has been computed considering their 44 final users. In case of Peccioli Municipality we have considered 36 final users that actually pay for the service on 47.

Table 16. Upper limit of annual profit and costs for services by different stakeholders

Stakeholder	Unit cost (€)	Unit revenue (€, on average)	Weekly hours actually demanded	Upper limit of annual profits or costs (€)	Actual annual profit or costs(€)
Cooperative of Peccioli	15	20+VAT	312	137,280 +VAT	81,120 +VAT
Peccioli Municipality	20 +VAT	5.31	312	- (467,276.16 +VAT)	-(238,330.56 + VAT)
Final user (unit)	5.31	-	7.09	-3,313.44	-1,957.69

Numbers in bold are average values.

1,957.69 is the costs for services annually paid by the final users.

4.2.2 Municipality's perspective

The analysis of co-payment for current services delivery gives also an indirect analysis of the financial model behind the perspective of municipality. Weekly costs and revenue for home services consists of payments of service to service providers (€20 +VAT of hourly costs, +20% in case of hours of service at night) and revenue from final users co-payment for the services.

Table 17. Average costs and revenue of Peccioli Municipality for service delivery

Cost variables	Day service (st. Dev.)	Service at night (st. Dev)	Total weekly hours demanded [day + night]	Total
Unit Revenue	€5.31* (4.00)	€9.80** (3.62)	312+17	€1,823.32
Unit Costs	€20+VAT	€20+20% +VAT	312+17	€6,648.00+VAT
			Difference	-(4,824.68 +VAT)

*Mean value computed on 47 final users; ** Mean value computed on 10 final users

4.2.3 Final users' perspective

Peccioli Municipality has listed the number of final users that received assistance and how they pay for the service.

Since there are some final users that are not assisted by the main Peccioli cooperative of services the set of people that are registered in the Municipality database (47 final users 11 of which pay 0 for the services) and follow the program of services is different from the group of final users (44) indicated by the cooperative.

45.45% of final users receives money for paying assistance (in Italian it is defined as "indennità di accompagnamento").

77% (36 units) of final users following the Peccioli Municipality program pays a hourly price that is different from 0 (according to their ISEE). 27% of these payers (10) requests one night assistance, at least with a hourly payment of €9.80, on average.

ISEE values in the table are calculated considering that hourly cost for day care service corresponds to 0.08% of final user's ISEE (as reported by Peccioli Municipality)

Public co-payment is calculated considering the % ratio of how a final user pays for one hour of service and the cost for the Municipality (20€).

Table 18. Summary statistics of final user hourly payments(€) –subset of actually payers (36 on 47)

	Min	Median (IQR)	Mean (St.dev)	Max
Hourly costs paid for day care service	4.00	5.75 (4.87)	6.93 (3.08)	12,00
ISEE	5,000	7,187.50 (6,093.75)	8,663.19 (3,853,20)	15
Final user co-payment	20.00	28.756 (24.37)	34.65 (0.15)	60.00
Public Co-payment (%)	40.00	71.25 (24.38)	65.35 (0.15)	80.00

People asking for services at night have a family ISEE relatively higher (10,250) than the total sample of actually co-payers. However this difference is not statistically significative.

Table 19. Summary statistics of final user ISEE(€) – subset of users requesting service at night

	Min	Median (IQR)	Mean (St.Dev)	Max
ISEE	5,000	10,625 (5,937,50)	10,250 (3,855.01)	15,000

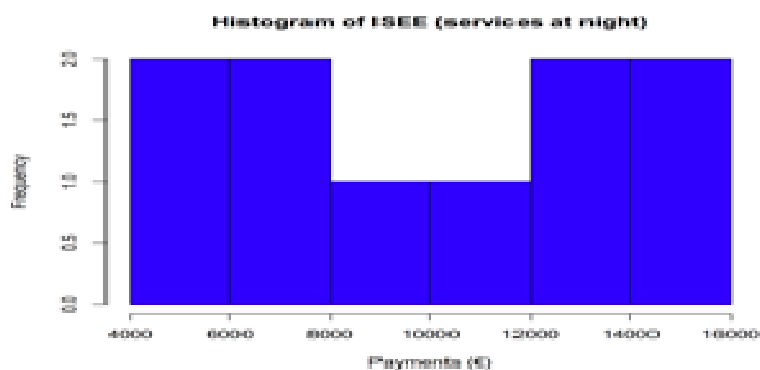


Figure 12. Frequency of demand for service at with respect to the Family income (ISEE)

There is a sort of U-shape relationship between family income (ISEE) for users asking service at night.

An explanation of these shape can be done considering that families with a very low income, consider private home care assistance too expensive. By contrast when family income is relatively higher and final user or his/her family can pay for a private care assistance, costs for some hours of private assistance at night is higher than final user pays to Peccioli Municipality.

This means that private and public home assistance become complementary services as the family income increases.

We should also consider that, since Peccioli home service program has a weekly upper limit of 12 hours per final user, asking for home assistance for a whole night is rare because it consumes almost all hours weekly available.

In conclusion, the above analysis has shown both difficulties and potentiality for Robot-Era service adoption. The barriers to Robot-Era diffusion are expressed in terms of:

- 1) final users has limited annual income to absorb the investment of robot; it is also because:
- 2) final users pay a relative small price for the services;
- 3) people that are served at home have a relative low mobility and their live and habits are strongly influenced by severe pathologies. Among other, and because of the advanced age, they may have reduced psychic abilities. It may be a problem for testing and diffusing robot technology. People with reduced psychic abilities, e.g., after a stroke, needs specific robot and technology that is not listed in the Robot-Era system of technology.

4.3 Health care and services for elder people in Örebro, Sweden

The municipality (local government) is responsible for giving service to elder people.

4.3.1 Domestic care/domestic service

When you need some help to take care of your daily life you get service and care to be able to keep on living at home. Examples of services:

- cleaning
- washing
- shopping
- medicine
- rehabilitation/ fitness training
- safety alarm
- personal care

You can apply for a certain amount of hours for cleaning, washing, shopping and window cleaning. If you need more help you can get an assessment from a special officer at the local commune.

4.3.2 Fees for care and support

In Örebro municipality there are fees regarding home care, home services, home health care and health care facilities.

Table 20. Service and unit costs

Service	Costs (€)
Home service	34.28 per hour
Home health care	34.28 per month regardless of amount of service
Maximum fee for service for a few hours	20.47 kronor per hour
Maximum fee for care and service living facility	197.65 per month

4.3.3 Different kinds of living facilities for elder people

In Örebro there are several kinds of living alternatives for elder people.

1) Senior living facility

In privately owned condominium buildings there are common apartments as well as ones especially adapted to older people, called senior living apartments. If the residents need care and service they will receive it from the municipal home services. One example is the Ängen living facility.

2) Care and service facilities

Care and service homes are available if you are in need of more extensive service and care.

3) The Ängen living facility

The Ängen living facility hosts health care- and service home with 56 apartments. The rent for the apartments range between SEK 4 177:- and 4 415:- + food cost 2 990:- per month. There are also 42 senior apartments.

5 Current Marketing Models in AAL and for Radical Innovations

The marketing model for Robot-Era gathers different approaches and current marketing models. An overview of the current marketing models for innovative everyday technologies as well as AAL products and services emphasizes the most important aspects concerning the development of a complex marketing model for a robot and reveals present deficiencies of already existing marketing models in that field.

This paragraph focuses a selection of current marketing models regarding innovative everyday technologies, AAL products and robotic systems. The selection was made due to a possible transferability and applicability for Robot-Era activities in the future and the accessibility in the course of the research process. The aim of this marketing model analysis is to show how innovative technology companies advertise the consumer benefit through their product and which criteria they focus within their advertisement. Therefore a short overview of present marketing activities (in television and on websites) will be presented as well.

Since the positioning strategy for a product and its distinction are relevant factors to reinforce its competitive advantages it is important to take these factors in consideration when looking at the marketing model behind the product (or service). The analyzed current marketing models differ distinctively in their strategy.

5.1 Current marketing activities for innovative everyday technologies

Innovative everyday technologies describe technological devices in people's daily life. They include smart phones, cameras, tablets and electronic entertainment devices in any kind, such as TV-sets, game consoles or hi-fi systems. The human beings operate the devices, i.e. the interaction can be characterized as being directly. The devices enrich their lives by supporting and assisting them in their daily duties (through functions as remembering, reminding and alarming) they enable communication (through telephone, chat, email functions), they provide information (through internet access or navigation), and they serve to entertain (photography, video, TV, music, games).

The technology is mainly promoted through the values and benefits it provides for peoples lives. It can be stated that the marketing models for innovative everyday technologies are based on an **emotional selling proposition** (Kotler et al. (2011)). The marketing focuses the emotional usefulness of the product. It is not so much the product itself that is promoted but rather the feeling it provides using the product and the meaning that is accompanied by the usage. The strategic orientation of the marketing lies in an improvement of the subjective quality of life.

These feelings and associations are for example a deeper and better connection to close people, becoming a better human being (regarding environment issues), having more time for others, experience happiness (starting a family and taking care of it, building a common future with the loved ones), being able to enjoy a healthy and good life, experiencing joy, happiness and love.

Examples

- 1) Nikon
 - a) Message: "I am part of the world"

- b) With pictures people are able to keep and remember impressions and memories forever, shared with others pictures enable people to participate and take part in other peoples lives. This leads to a strong connectedness between each other, the feeling of being deeply rooted in the world gives people the impression to be at the right place and not lost. So taking and sharing pictures might reinforce the feeling being a special and important part of the world.
- 2) Iphone
- a) Message: "Everyday more people enjoy music on the iPhone than on any other phone"
 - b) The phone enriches people's life, using the phone and its features (such as music) provides positive emotions (as happiness and love) and gives people the feeling the phone is essential to their and other people's lives.
- 3) HTC
- a) Message: There is a similarity between Technology and Nature The analogies between Technology (a phone or tablet) facilitates emotions as one's relationship towards nature: a man touching a stone, the phone becomes a smart phone; a face-to-face conversation between a man and a woman at a dinner table, switches slowly into a conversation through computers and shows that the quality and joy of that conversation is the same.
- 4) Huawei
- a) Message: "Helping us in our daily life, technology makes life easier", it reinforces and strengthens our relationship to the people we care about the most
 - b) A smart phone might support our daily duties; it reinforces us to help others. A father wakes up early in the morning, drives into the forest and catches a great picture of a rare butterfly, he sends the picture home to his wife and son and this way helps the son fulfilling his homework, accomplishing successfully a report in school mother and father are proud of their son and the son is grateful for his family's caring and support.

5.2 Current marketing activities AAL products and services

AAL products and services describe technologies, systems and the service that goes along with it such as smart home technologies, emergency home calling services, intelligent lawnmowers and vacuum cleaners or systems operating on an intelligent (semi) automatic control (home security and alarm systems, electric shutters, blinds, doors and gates etc.).

The marketing models for these kinds of products focus the **pragmatic usefulness**. The technology is mainly promoted through its actual features and functions and the practical benefits it provides. In contrast to innovative everyday technologies (as described above) it can be stated that the marketing models for AAL products and services are based on a **unique selling proposition**, which highlights a distinction through the product (Kotler et al. 2011). The associations with these products concern aspects of security, reliability, comfort, convenience, simplicity and user-friendliness. It is rather the product itself and its functionality that is promoted here – not so much the emotions that go along with the usage. So the strategic positioning of the marketing lies in an improvement of the objective quality of life.

Examples

- 1) Somfy
- a) Message: "Clever engines and control systems for blinds, sun protections and gates"

- b) Marketing focuses pragmatic explanations like saving energy through better isolation, increasing security through burglary protection systems and high comfort through remote control.
- 2) Telekom eHealth
- a) Message: Innovative information and communication technologies enable connectedness and therefore a better healthcare.
 - b) Marketing focus functions as telemedicine, mobile medical round, and communication over video chat.
- 3) RWE smart home
- a) Message: Home control systems are not an unaffordable luxury. User-friendly smart home solutions are deliverable for every household.
 - b) Focus lies on electronic devices and heating.
- 4) Cibek
- a) Message: Developing easy to use building technologies so that elderly people are able to live in their own home.
 - b) Focus lies on light systems, shades, heating, garden and security systems.

5.3 Current marketing activities for robots

The marketing models for service robots are capable of improvement. Outside the research field robots are not yet present in the minds and daily lives of people because even successful projects show very few marketing activities so far. The existing service robots that were taken into account for this overview provide hardly any marketing activities at all²⁷.

Current projects concerning service robots²⁸ promote special functions of the robot and the solutions that were developed. The marketing activities are limited to the **presentation of possible functions the robot is capable of and the scenarios it is being used in**. So the marketing models might be described as **scenario-based** and **solution-based** e.g. lifting up a person, opening and delivering bottles from one room to another or enabling communication. A specific definition of the potential user group is yet missing, that is why it remains **unclear who is addressed and who is expected to buy the robot**. In other cases the marketing does not yet address end users but rather areas as research, education and further development.

27 Honda's Asimo can be considered exceptional <http://asimo.honda.com/>.

28 E.g. Care-o-bot, <http://www.care-o-bot.de/de/care-o-bot-3.html>,
RIBA <http://rtc.nagoya.riken.jp/RIBA/index-e.html>,
<http://www.giraff.org/?lang=en>, Ava
<http://www.irobot.com/us/learn/commercial/ava500.aspx>

Service, Business and Marketing Models Related to Novel Services Implemented with Robot-Era Systems

5.4 Design of Service, Business and Marketing Models for Robot-Era

5.4.1 Service Models

To design service models for Robot-Era services we need to start with the current models and the statistical and cost analysis done.

In short, remember that current service model consists of a financial partnership (co-payment) of municipality that pays the service provider that organizes carers for the direct service at home (see the reimbursement scheme of current services in the section that analyses the current service stakeholders). The current service system consists of traditional carers at home for a number of hours that are agreed between service provider and final users. Service packet consists of at home and outdoor activities made by carers (the list of services is indicated in the analysis of service provider), being different services not easily separable in terms of time, effort and activities.

There is not a specific technological support to deliver these services that can be comparable with robot.

This section is also based on the model of robot services that are currently tested: Shop&drug delivery, Communication and alert; Garbage.

The current model (it must be updated with the analysis of cost-effectiveness of Robot-Era solutions) of Robot-Era services is based on the activities of three different robots:

- 1) home robot (DORO);
- 2) condominium robot (CORO);
- 3) outdoor robot (ORO).

that are currently employed in the following model of services:

Table 21. Model of Robot-Era services that are currently tested

	Service Model	Kind of robot employed
Shop&drug delivery	1) final user or caregiver needs to go to shopping. So he or she sends for the home robot. 2) He or she lists products and the list is sent to the shop. 3) The outdoor robot goes to the shop, fills the shopping and then comes back to the condominium. 4) Condominium robot lades the products and then goes to the final user apartment. 5) At home robot alerts final user that products are arrived.	home robot (DORO) condominium robot (CORO) outdoor robot (ORO)
Communication and alert	In case of problems such as gas leak, 1) the home robot alerts final	DORO



	Service Model	Kind of robot employed
	user. 2) An automatic Skype call alerts external people that can check the final user and apartment conditions. DORO	
Garbage	1) final user calls the home robot that alerts condominium robot; 2) home robot alerts final users that the condominium robot is at the final user's door. 3) Garbage is filled on the condominium robot that carries the trash at the condominium door. 4) Out door robot receives the garbage and goes to the garbage collection centre.	DORO CORO ORO

A first recognition of the activities and testing of Robot-Era, also considering the answers of the traditional service providers, shows that robot is more useful for outdoor activities. Robot at home is used for communication and surveillance at night and it can be a good point for the robot because at home surveillance at night consumes high hours of carers and it may be too expensive for the Elderly. However the potentiality of robot for home assistance at night is probably limited to the condition that people should need no intensive and health assistance at night. Robot cannot substitute health carers but it can signal a problem to a health carer.

There are also some activities that are currently implemented by carers that are too complex to be transferred to robot e.g., assisted bathing.

These preliminary elements suggest a system of Robot-Era services that integrates different micro-models where the three robots and stakeholders are involved in the following general scheme.

In this perspective Robot-Era system of services and its business model should be based on the following assumptions:

- 1) cost of the services (variable costs) should be comparable with the level of current service price. For instance, considering the Peccioli experience, the system of service should have a hourly price near to €20. Within this hour different services should be delivered. A singular final user should pay a price near 5.3€ per hour, probably with a co-payment that can be imputed to Municipality or to the service provider's organization.
- 2) cost of the services (fixed costs). The system of three robots for delivering services should be considered three different systems of co-payment. In particular, some problems may arise in case of the at home robot. It probably may be too expensive (DORO's current price is about €30,000) for a family or a final user with a relative low annual income. With respect to the condominium robot (CORO's cost is about €15,000), it can be co-paid by final users living in the same condominium in case of a not structured model of assistance for the Elderly. In case of the system considering a structured organization such as hospices, condominium robots can be bought or co-paid by hospice's administration. Outdoor robot co-payment can be co-paid by Municipality. This solution is suggested by the fact that final users currently pay taxes on garbage management and one of the robot services is garbage transportation.

Through a progressive tax Municipality may finance out door robot(s) that can be used for service for the Elderly and also for all the services that the community in its whole needs such as a door to door garbage management.



In alternative the outdoor robot can be bought or co-paid by the service provider’s organization since outdoor robot is a fundamental technology that drastically increases the efficiency of outdoor service delivery such as transportation, shopping, laundry an garbage management. Outdoor robot increases the productivity of service provider of current services.

Table 22. Fixed costs (robot) management strategies for Robot-Era models

Robot (as a fixed cost)	Principal payer for the robot(s)	Co-payers
At home robot		Municipality may propose some fiscal advantages for the investment in robot.
Condominium robot	Alternative A: Final users living in the same condominium co-pay Alternative B: Administration of structured residences for the elderly e.g., hospice	Municipality may propose some fiscal advantages for the investment in robot.
Outdoor robot	Municipality Service provider organizations	Service provider organizations Municipality

5.4.2 Model of the system of services

In addition to the model of Robot-era services that are currently tested, the system of Robot-Era services should also considers:

- 1) Food delivery
- 2) Laundry
- 3) Indoor escort at night
- 4) Object transportation
- 5) Walking support

In particular, for services such as Food delivery and Laundry transportation, the system will follow the same process explained for the shop and drug delivery and garbage transportation since in these different services the activities of robot do not qualitatively change.

With respect to walking support the system is mainly managed by the outdoor robot. Indoor escort at night is a service that is managed by the at home robot, only.

5.5 Service and Business Models

As indicated in the description of the specific inputs that should be considered for a service and business model related to Robot-Era services, we still need information from final users that are essential for a good design of future scenarios and the related implications in terms of costs and revenues.

However, a service and business model that is closed to reality, because of its assumption, should be sustained by correct data and information that cannot be proposed before the cost-effectiveness of the Robot-Era service is completed.

In the next months, in parallel with the inclusion of final users that will test the first Robot-Era services a cost effectiveness analysis useful to design both service and business models of Robot-Era will be achieved.

With respect to the potential reimbursement regime of Robot-Era services, it could be a modification of the current one where final users and municipalities co-pay for service delivery. However the best percentage of co-payment for robot-era services is a data that is not still available before the analysis of the questionnaires administered to final users. The scheme of current service co-payment for services in Peccioli can be probably a basis for suggesting the final business model.

The business model for the Robot-Era services is detailed in appendix.

5.6 Marketing Model related to Services implemented with Robot-Era Systems

Creating a marketing model for the Robot-Era Robots is a special challenge for several reasons: When talking about the robot, it is obvious that this product is a radical innovation (Braun-Thürmann 2005) containing several new issues for potential customers. Besides, the service robotic market is a totally new field for marketing activities. That means there are no experienced competitors in the European market. One opportunity is to follow the Asian market as an example, but cultural differences between both societies make the transferability difficult. Comparing Asian and European countries, the perception of robots varies strongly.

Furthermore the user group of elderly people is acting more critical towards radical technological innovations than other user groups. For example they are more concerned about the usability and privacy (see research WP2: D2.3) than seeing personal advantages like mobility and independence. Paragraph Creation of a customer oriented marketing strategy discusses the needs and requirements of elderly people but until now it remains uncertain if they will be the main target group which will be really buying the robots frequently – or if this will be done by family member, institutions etc.

The stakeholder analysis showed that there are a lot of important stakeholders who will possibly buy and use a robot. But to date it is not clear who will be responsible for the production and distribution of the developed Robot-Era robots. One reason for cautious economic and political actions might be the risk to fail due to high production costs of the robots combined with a lack of assurance regarding the market success. Also the complex management of infrastructure, the time-consuming technical development and the risk of low market demand are barriers that slow down economic initiatives in this field. Prognosis for the European market for service-robotics seem optimistically (see International Federation of Robotics (IFR) Journal of Robotics) but are often based on theoretical data and do not refer to validated empirical information most of the time.

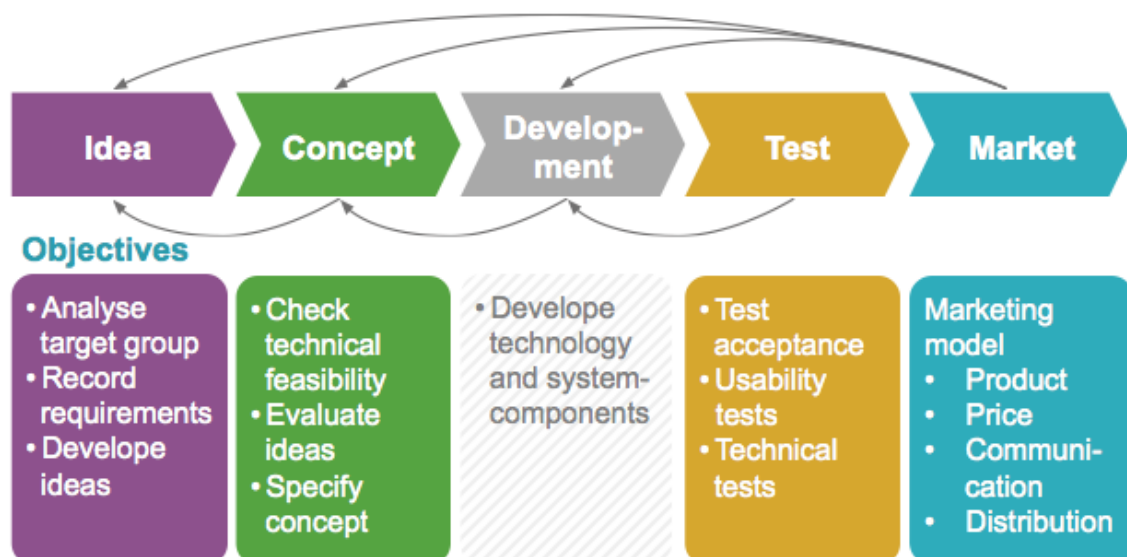
Also the brand and image of a product/company are important issues connected with the perception of quality and personal benefits of future customers. In the case of Robot-Era it is not possible to include these aspect in a marketing model, because it is not yet clear who will produce the robots eventually. It is possible that the European government starts an offensive to subsidize the production of service robots. Another option could be that one company starts the production of service robots and creates a monopole by taking the risk as well as all market advantages. Also networks of different industrial partners can possibly appear to connect the important competencies in this field and start the production of service robots. Depending on the further development of cooperation's for the production of service robots the marketing model for Robot-Era will change. Especially recommendations regarding the price and the distribution are based on theoretically assumptions and cannot be seen as an certain orientation for further development.

The following paragraph gives an overview of how a customer oriented marketing model for Robot-Era might look like. The first step is to describe the target market and the target group. In this deliverable recommendations are given regarding the target group of elderly people. For other target groups (e.g. caregiver staff, management of care facilities, municipalities) further empirical research will be carried out and added to the second report on Robot-Era service, business and marketing models (D9.4). All recommendations regarding the target group of elderly people are based on empirical data collected in WP2 and on secondary analysis of current data.

The structure of this paragraph is oriented on the theoretical input given in paragraph Strategies and Methods for Marketing Models (YOUSE) but until now it is not possible to generate well-founded recommendations for the pricing and distribution as mentioned above. Those parts of the Robot-Era marketing model are strongly connected to the service and business model. Therefore the development of pricing and distribution strategies is depending on further development of services and business models. The following statements can be seen as recommendations and will be constantly optimized due to additional work and the generated growth of knowledge in the course of the project.

5.6.1 A customer oriented marketing strategy for Robot-Era Systems

To create a customer oriented marketing strategy, the customer needs and requirements should be included in all phases of the innovation process. Even though the potential user cannot take an active roll during all steps of the product development, it should be guaranteed that the functions and services fulfill the user expectations and fulfill fundamental requirements. During the user research in the first phase of the Robot-Era project many information and requirements about the target group of elderly people were collected. This generated data will serve as a basis for the creation of a Robot-Era Marketing model. During the project additional empirical data (e.g. WP8/WP2) about preferences and dislikes of potential users will be collected. As shown in Figure 13 the development of the robotic systems is iterative and user oriented.



Source: YOUSE GmbH Innovation Process

Figure 13. Iterative Innovation Process

5.6.2 Segmentation of target market

Market segmentation is needed to collect current information on the selected market. In the case of the Robot-Era project statements regarding the marketing model are related to the European market, thus we are using a geographically segmentation.

Also demographic segmentations will be made for the target group of elderly people using the Robot-Era System. The Robot-Era proposal segments the group of elderly people along variables like age and level of autonomy. These variables can be seen as separation criteria for the collection of empirical data. But also other demographic variables like income, gender and marital status will be collected and taken into account during the data analysis.

Also geo-demographic segmentations for different types of housing (e.g. assisted living facilities, independent living in house, independent living in flat) were made during the data collection for WP8.

A description of the behavioural variables (like attitude towards technology and frequencies of use) will be given during the data analysis of the first experimental loop. These aspects are useful to have the opportunity to describe the target group in detail without narrowing the target group too early.

5.6.3 Description and Definition of the Robot-Era target group

To create a customer oriented marketing strategy a definition of target groups is necessary. The systems developed in Robot-Era aim mainly for the support of elderly users and their direct caregivers. Furthermore, several stakeholder groups have either the chance to benefit from the use of robots, or have important influence on the entire system of Robot-Era e.g. by delivering specific services. As defined together with partners of WP9, the most important stakeholder groups besides the primary users "elderly" and "caregivers" are: shop/shop personnel; call centre/call centre operator; emergency personnel; meals-on-wheels provider/restaurant personnel; several service providers; municipalities; insurance companies and pharmacy/pharmacists.

Due to the fact that detailed research on these secondary/tertiary stakeholders is planned later in the Robot-Era project, and due to the impact of the primary user groups on the functional development of Robot-Era so far, the secondary/tertiary stakeholder groups and their relevant implications for marketing will be illustrated in D9.4 (which will be the 2nd version of D9.2). The actual D9.2 will deal mainly with marketing implications regarding the primary user group "**elderly people**", because this group will possibly perceive the main personal benefit through the individual use of a robot.

The Robot-Era project focuses its actions on a specific subgroup of elderly people: Males and females over 65 years with moderate health problems and movement and cognitive deficits, living alone or with their relatives but without a devoted caregiver.

The target group of seniors itself consists of several different segments. Reasons for this heterogeneity are interpersonal differences that increase with age, such as in education, experience, interests, financial status and physical and mental fitness. A universally valid segmentation proves to be difficult due to this heterogeneity. The following paragraph demonstrates main differences regarding lifestyle, age related change and the financial situation, which are the basis for describing several needs of the target group (see Figure 14).

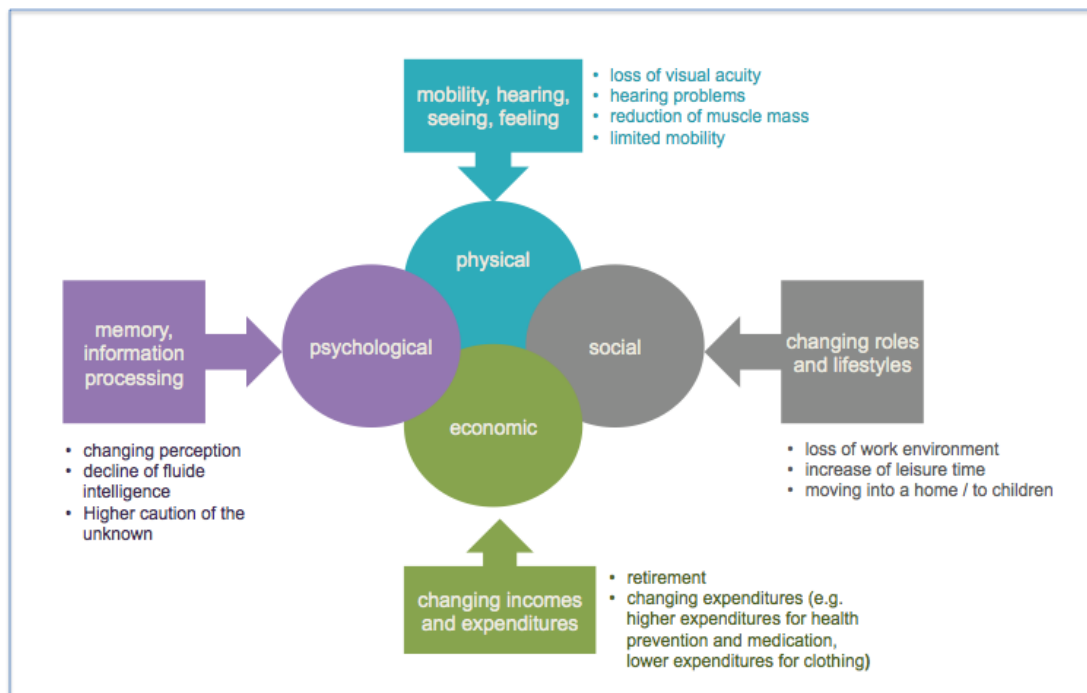


Figure 14. Age related changes

5.6.4 Social issues and change in values

The customer group “elderly people” is a heterogeneous group, which can be divided into three customer segments according to the particular characteristics of lifestyles (Grey, 1998).

The first segment covers the 50 to 59 year olds: The so-called “**master consumers**” are at the peak of their career and show the highest income rates among all three segments. Hence, they have the greatest purchasing power. They show an active and experience-oriented lifestyle and open-mindedness towards new technologies, and can be characterized as being free-spending.

The second segment covers the 60 to 69 year olds. Since the majority of the so-called “**maintainers**” is retired they find themselves in a phase of reorientation. This new experience allows them to spend their time with family and friends or engage in leisure activities. They are considered to be in good health and physical performance. Due to their financial security they are able to enjoy their lives and newly gained freedom.

The third segment covers the 70 year olds and older ones. The so-called “**simplifiers**” show a more secluded, calm and domestic lifestyle and therefore fulfill rather traditional behavioral roles. They tend to identify themselves as “elderly” and show typical complaints of old age. Compared to the other segments, their financial capabilities are limited. (Grey, 1998)

Taking this into account, the Robot-Era target group includes probably two different types of lifestyles – the maintainers (60-69) and the simplifiers (over 70 years).

Besides the relevance on income, it is also important to consider different life stages. According to the stage model Phase 8 “Change and Experience” (60-74 years) and Phase 9 “Reflection and Reduction” (75 years and older) are important phases related to the Robot-Era target group.

Phase 8 - Change & Experience (60-74 years):

In this phase, seniors reorganize their new leisure time after retirement for hobbies or events they did not have enough time for while working, and that makes them feel good or needed: **traveling, cultural activities, learning new things, or volunteer work**. Their spending power is usually higher than before since the house has been paid by now and children take care of themselves. The focus of this age group is on **enjoyment and activity**.

Phase 9 - Reflection & Reduction (75 years and older):

As long as seniors are still healthy in this phase, they try to prolong the amenities of the former phase as long as possible, while **trying to compensate for age- or health-related limitations as good as possible**. The focus is more and more on **social contacts and activities** that are deemed most important. Since the remaining lifetime is valued very high, the tolerance for irrelevant issues, failures, or disappointments decreases. If illnesses dominate life, **support by others** becomes most important. These life themes provide a basic idea of the Robot-Era target group and their needs that can be supported by robotic solutions.

5.6.5 Psychological and Physical age-related changes

Every human-computer-interaction requires certain sensory, cognitive, motion capabilities (e.g. in order to be able to read a display, understand the menu structure and push the correct buttons). In the course of ageing, the performance of these abilities changes. The requirements of elderly and their user behavior concerning the handling with technology need to be taken into account when developing a service robot. (Glende, 2010)

The process of ageing can be differentiated into "normal ageing" and "pathological ageing" (cf. Biermann and Weißmantel, 1995). Pathological ageing refers to diseases and illness-related disabilities. The resulting handicaps from pathological ageing do not concern all elderly people though (cf. Göbel, 2007). Since the majority of elderly people is concerned by changes that go along with the normal ageing process these typical physical (sensory, motion) and psychological (information processing) changes will be an important issue to be considered.

Sensory changes affect the **visual perception** (e.g. reduction in visual acuity, decrease of accommodation ability or increase of lighting requirement), **acoustic perceptions** (as the age-related hearing loss) and **haptic perception** (e.g. reduced sensitivity of the finger tips due to the deceleration of blood circulation).

Motion changes affect the **mobility** and **flexibility** of a person (e.g. reduced manual dexterity, i.e. the person loses the ability to move and control his or her fingers properly) due to the general decrease of muscle strength and deterioration of the entire musculoskeletal system.

Mental changes affect cognitive skills, such as the abilities to concentrate, memorize and remember. While these changes concern the normal ageing process, pathological changes need to be considered here as well, such as the decline of crystalline intelligence, i.e. that **complex tasks might not be performed** as they were intended (Glende, 2010).

Besides these physical and psychological changes during the aging process also social and economic changes are to be taken into account in the development process of a service robot.

5.6.6 Economic situation of elderly

Based on worldwide demographic changes²⁹, the economic significance of elderly as a target market is growing. Like the overall trend of single households in the EU (Eurostat ,2013) also the household size of people over 50 years decreases while the average monthly income of this group (per household) increases (DZA, 2008); The Statistical Federal Office, 2007). Parallel to this development the market for elderly people is constantly growing (DZA, 2008; Buslei and Schulz, 2007; SENTHA, 2000).

The combination of relatively high incomes and low expenditures, e.g. because the children have moved and began to live independently or the accommodation for personal use is paid off, makes it possible to spend more money on consumption. At the same time elderly people have a high affinity to save a certain amount of money (cf. Statistical federal office , 2007, p.54.). Combined with a good health status, this development increases the mobility and socio-cultural activities of elderly people (Mollenkopf, 2008).

People 60+’s consumption deviates to some extent from those of the average household in the EU (Eurostat, 2013). The most pronounced differences can be found in health and housing expenditures. On average, elderly households in the EU spend two per cent more of their total expenditures on healthcare and five per cent on housing. As the personal expenditures are strongly related to different European countries Figure 14 shows the distribution of health care and housing expenditures per country.

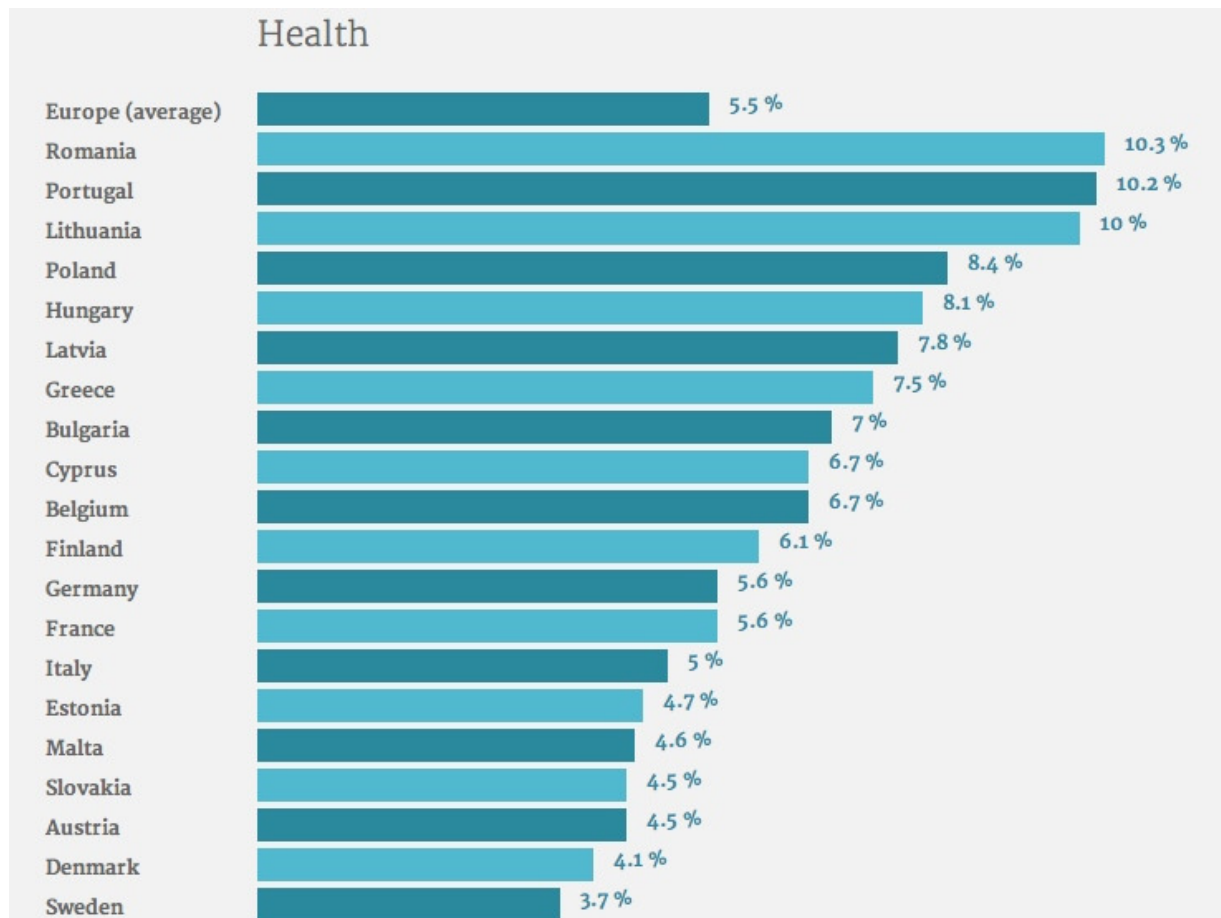
The following list gives an overview of consumption expenditure of 60+ European people (Eurostat 2013):

Table 23. Consumption expenditure of 60+ European people

Consumption items	% on total consumption
Housing and Utilities	30.8%
Food & Non-Alcoholic Drinks	21.4%
Transportation	8.6%
Recreation and Culture	7.1%
Home Maintenance	5.5%
Clothing & Footwear	4.1%
Restaurant and Hotels	3.8%
Communication	3.0%
Education	0.2%
Other	7.2%

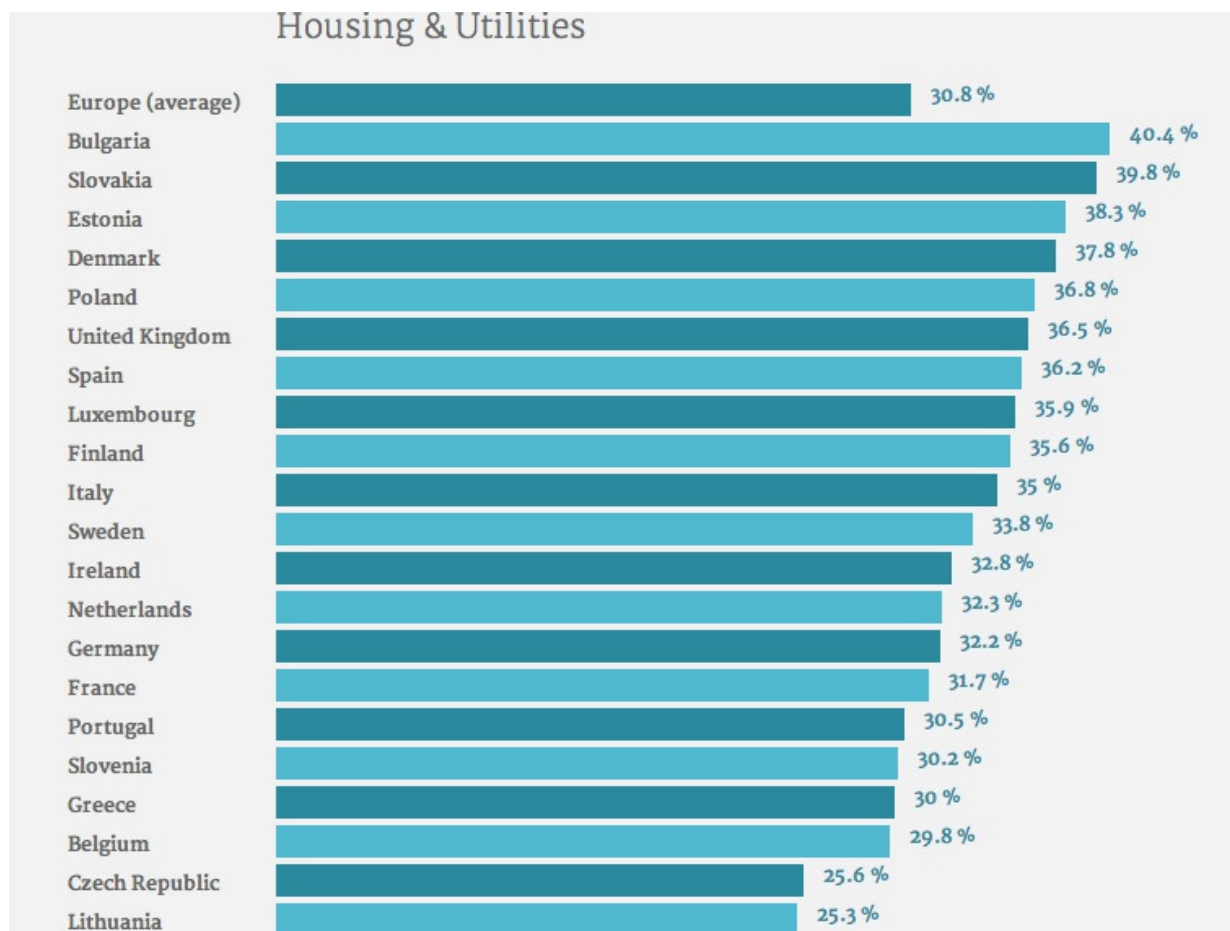
Source: Eurostat 2013

²⁹ The median age increased from 35.7 years in 1992 to 41.5 years in 2012 and it is projected to rise to 47.6 years in 2060 in the EU. (Eurostat, 2013).



Source: Eurostat (2013) http://knowledge.allianz.com/demography/retirement_pensions/?2352/How-European-retirees-like-to-spend

Figure 15. Health Expenditures Europeans 60+



Source: Eurostat (2013) http://knowledge.allianz.com/demography/retirement_pensions/?2352/How-European-retirees-like-to-spend

Figure 16. Housing Expenditure Europeans 60+

Some examples show the importance of the customer group of 50+ for the European market: 45% of all cars, 50% of all face care products and 35% of all package tours were sold to this target group. Even bigger is the market of luxurious products – 80% of all luxury cars were both by persons older than 50 years (Klesse, 2006, p.44.).

5.6.7 Personas as a tool for target group description

One opportunity to describe the target group is a persona. Personas are archetypal descriptions of person of the target group based on empirical studies (cf. Pruitt & Adlin, 2006).

The figurative description of target group member enhances the empathy and makes it easier to familiarize oneself with the target group. Typical end user personas from the target group of elderly people might be (see examples in Figures 17-18):

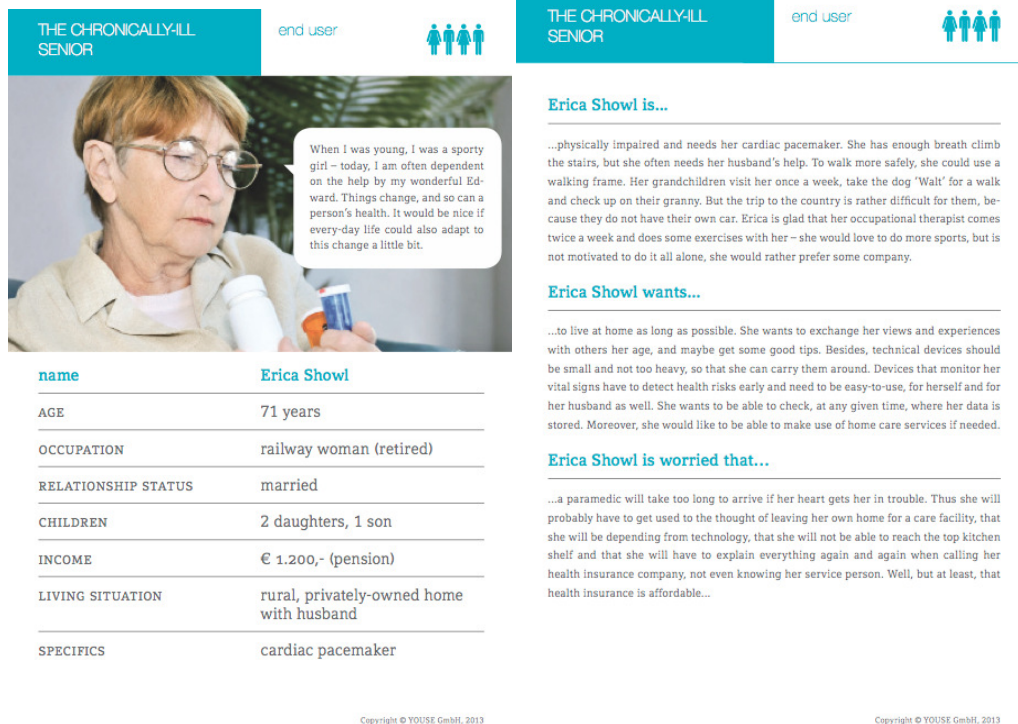


Figure 17. The chronically ill senior

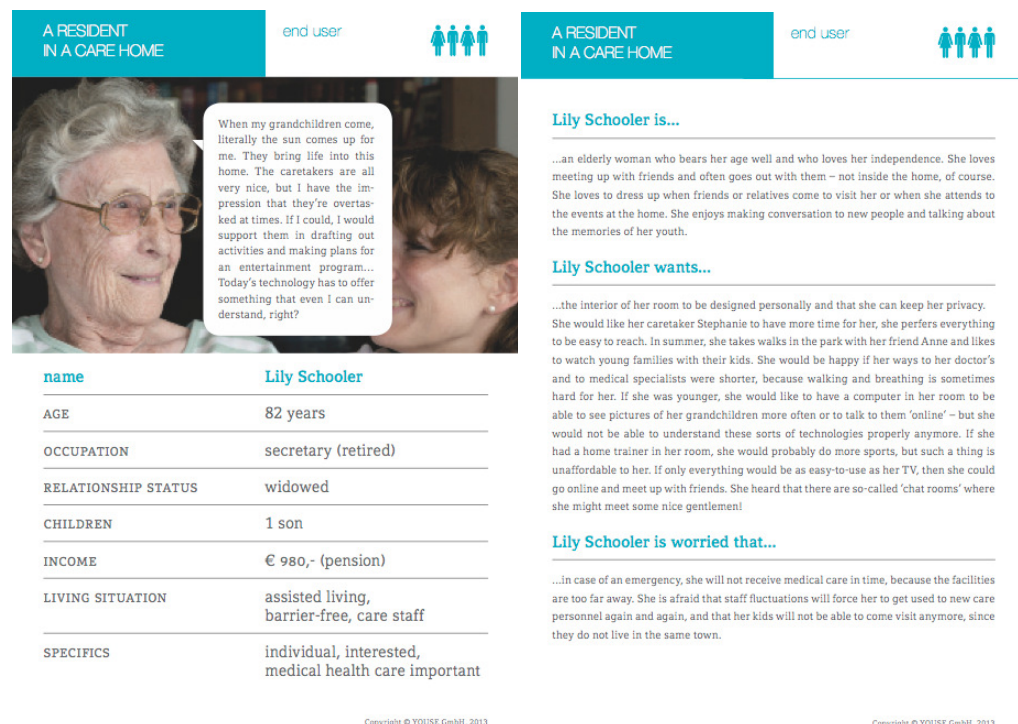


Figure 18. A resident in a care home

5.6.8 Use of Technology of elderly people

Technology use of seniors depends on life styles and more individual criteria as described before. Following a study from O'Brian (2010) seniors (aged 65-75) report between 19 and 31 interactions per day on average (e.g. with microwaves, computers, or answering machines). Although elderly users mostly accept new technology less than their younger counterparts, they are motivated to use it if the technology is compatible with their current lifestyle and routines, and if they are sure that the benefits clearly outweigh the efforts of learning something new (Ryu et al., 2009). Table 23 displays factors promoting acceptance of and the need for technology, and show clearly, that age alone does not predict technology acceptance, but the interest for innovation does. Furthermore, a rejection of technology might rather stem from a lack of trust in one's own technological capabilities, i.e. a lack of self-efficacy (Bandura, 2007): if seniors are afraid of not being able to handle technology, they will probably not use it.

Table 24. Factors promoting the use of technology

Factors influencing technology acceptance	Factors influencing the need for technology
Costs	User generation / cohort
Compliance with individual needs	Style of housekeeping
Personal experience with technology usage	Number and type (partner, children) of inhabitants in household
Accessibility barriers (physiological, cognitive)	Personal attitude towards technology

Source: Flick, 2012

With respect to the use of ICT technology, seniors aged 65 years and above are still much less experienced than younger users, but they are rapidly catching up (cf. Flick, 2010).

5.6.9 Specific needs of the target group

In Robot-Era, three main groups of elderly users have been defined, using the level of autonomy as separation criteria. The level of autonomy depends primarily on the motor-cognitive impairments and health condition, and on the environmental and contextual conditions that strongly influence the end-users' situations, such as adverse meteorological, traffic and soil conditions, commitments of the end-users, typology of house (apartment in condominium, cottage, detached/semidetached) etc. Based on these factors, three possible levels of autonomy have been defined and described:

- **Users with High Level of User Autonomy (HLUA)**
The HLUA is characterized by the fact that end-users do not have particular deficits or limitations from either motor or cognitive point of view and that their medical providers suggest that they should be active and should execute autonomously as much as possible the ADLs.
- **Middle Level of User Autonomy (MLUA)**
The MLUA is characterized by elderly people with slight motor limitations of the upper or lower limbs and can carry out most of daily tasks, but in some cases they need support. End-users can also have impediments or commitments that necessitate further help from robots to execute these tasks quickly and correctly.
- **Low Level of User Autonomy (LLUA)**

Elderly persons having motor limitations or provisional bad health status such that they cannot move too much and need help to carry out ADLs characterize the LLUA.

These three groups would – following Maslow´s hierarchy of needs and the Kano model – have different requirements regarding a robot. While the HLUA might want a robot that excites them and thus motivates them to use it even though they would not necessarily need to, the LLUA might be mostly interested in obtaining safety and health support, without caring much about ethical and image issues.

In WP2 several groups of potential end users have been involved in Robot-Era to find out about crucial needs and play a crucial role in the development and selection of a custom-fit marketing strategy:

The most relevant conclusions are that:

- Particularly older elderly (over 75 years old, often MLUA and LLUA) can benefit from Robot-Era and the possible **physical support** and **safety functions**, which are seen as the main USP;
- HLUA, MLUA and LLUA can benefit from the robots ability to be a **medium for connecting** and **supporting the relationships within older people, family and carers**. Also, all three groups are afraid that robots might substitute these relationships when designed poorly – thus this fear needs to be cleared.
- The indoor robot is considered very interesting by elderly participants for what concerns:
 - Safety, covering activities as surveillance and emergency warnings
 - Supporting risky or heavy movements: the mechanical arm capacity has to be extensive for taking objects over the furniture;
 - Household works;
 - Health management, for reminding medicine to take, bringing objects/pills if the user is sick in bed and sending message to the family in case of need.
- The outdoor robot is judged important in:
 - Enhancing the feeling of **security** while walking outside
 - **Transporting** heavy items.
- Flexibility and adaptation to users health status and needs are extremely important, since needs can change and the opportunity of having different modules to change or add functions would raise the systems value significantly.

Recommendation for Robot-Era Service, Business and Marketing Models

5.7 Recommendation for Service

The main recommendation regards the need for investing in the complementary role of robot for some current services and the pivotal role in increasing the productivity of some other activities (e.g., outdoor activities).

A drastic passage between a human being technology to a pervasive and invasive robot technology is not probably the right path for increasing the probability of robot adoption in the future. To overcome the barriers to robot adoption we have to deeply analyze the characteristics of the final users and the way the current services are organized. It is was one of the perspective and goal adopted to the past activities (results are shown in the present deliverable) and they should be considered as guidelines for the next ones.

Another fundamental point and recommendation in designing and developing sustainable models of services is to involve the final user in the definition of the models (Turchetti and Geisler, 2013; Sandulli, 2013). Final users should participate from the very initial phase of the developing of the service design. Involving user in developing services and new solutions often increases the quality of the innovative service (Magnusson, Matthing and Kristensson, 2003). By contrast, however, different authors argue the capacity of the final user to produce innovative ideas, and problems may raise because final users have a limit horizon of knowledge and they have not the capabilities to know what technology can actually do in formulating their needs and the related ideas for innovative services. Finally, since final users are involved in the preliminary phases of the service design, final users wishes and needs can be different when the service is completely designed (Bennet and Cooper, 1981; Christensen and Bower, 1996).

However we are convinced that involving final users in Robot-Era model design should be a useful strategy for overcome the barrier to technology diffusion in a faster way, finding the upper limit for the complexity of the technology final user is willing to adopt.

In addition, involving final users in the service development reduces the risk of solutions (technology) that look for problems. In this case the probability of service diffusion is very low since all the strategies that one adopts to increases the probability of adoption produce the opposite effects. A lot of money is consumed with the effect to increase the final user's suspect on technology.

However a limitation for the suggested approach may originate by the dimension of a B2B rather than a B2C strategy. In the last case the effort to involving final user is too high with respect to the source of revenue. In fact, in case of a B2B strategy i.e., robot services can be sold to organizations and cooperatives of service providers, involving final users in developing services is not sufficient because the problem is how to organize services for final users.

This means that a new service design should involve both final users and service providers, but they have different targets. For a service provider, technology should increase efficiency and quality of its activity, because in his or her vision the mean to achieve the objectives (individual but also collective objective e.g, increasing the Elderly's satisfaction) is based on group of people that probably differ from each others. Managing heterogeneity is the problem of service providers.

By contrast, for a final user, quality is the most important element for evaluating a service and effectiveness plays a more important role than the efficiency. The subjective perception of time for final users differs from the service provider's one. Consider, for instance, shopping delivery. Old people with reduced mobility consider shopping delivery in a different way with respect to service provider and young people. For a service provider, saving time



and increasing his or her efficiency in delivering shopping to a relative high number of final users is probably the first reason why he or she decides to adopt a robot technology. And saving time is also the reason why a young or middle-age final user may request this kind of service.

However, elderly people are not interested in shopping delivery with robot because it saves time. While the main problem for young people and service providers is that they have not time, an elderly person has a lot of time but he or she probably cannot go out for shopping.

It means that the service model designed involving final users can be very good for final users but it could not be useful and it may reduce efficiency for the service provider.

In light of these considerations, model design is strongly related to the idea of the target group. Once identified the target group, it can be involved in the service model design.

Although robotic solutions are integrated within Robot-Era services, target groups differ. For at home activities and services that involve "at home robot", the main target group is represented by final user and/or his or her family. So families and final users could be involved in the service model design and development and relative business model based on a B2C approach should be implemented.

In case of outdoor and condominium activities using robot, the main target group consists of service providers, that could be involved in the service model design.

Table 25. Who Robot-Era can involve in service model design

Service	Strategy	Technology	Subject that could be most involved in the
At home services	B2C	At home robot	Final users and their family
Condominium activities	B2B	Condominium robot	Service provider
Outdoor activities	B2B	Outdoor robot	Service provider

These implications should be kept in mind in developing the business models.

5.8 Recommendation for Business Models

The same recommendations for the service model have been shared in the activities focused on the definition of the conditions that make the new services sustainable. Barriers to diffusion of the robot technology contribute to increase problems in medium and long run sustainability of the business related. A starting point is the current system of services that is mainly oriented to have a reduced percentage of fixed costs being focused on carers' activities. The new system of services within the Robot-Era model will probably change this tendency. It is a fact that the fixed component of the service costs (robots) is higher than the current service system.

Balancing the increasing in fixed costs must be the first problem that the business model has to resolve.

There are different strategies to overcome the problem. The first one is to involve intermediate organizations and the approach can change from a B2C to a B2B perspective. It means that the target group could be the service provider organizations rather than the final users. It is because the final user has a reduced capacity to absorb the initial investment of robots in a relative short time horizon.

Intermediate subjects or at least, a group or a cooperative of final users, have probably a number of people served and/or a system of revenue that can better sink the initial costs. It does not mean that the privilege target must be an agent or a organization formally focused on the Elderly' care; it is an priori hypothesis that restricts the selling area. An intermediate subject (e.g., a service provider of food delivery) may be interested in enlarging his or her service portfolio considering that the Elderly are a high potential target. Population distribution and demographic trend support the idea that a robot can be a good investment.

5.9 Recommendations for Robot-Era Marketing Models - Marketing-Mix related to the target group

Following the theoretical assumptions, the marketing model for the Robot-Era robots contains statements regarding the product, the price, the communication and the distribution. Based on the information and data drawn up in the market and target group description (paragraph 7.2 & 8.3) the following paragraph describes options and strategies to create a Robot-Era marketing model. Due to the constant growth of knowledge based on current and future project activities the following statements can be seen as first theoretical recommendations and not as rigid facts. These statements need to be validated through empirical studies with stakeholders and target group members in the near future to generate detailed information e.g. pricing and distribution.

5.9.1 Product

The Robot-Era robots as a product can be divided into physical and immaterial components.

The **physical components** are:

- Functionalities (direct functionalities of the robots);
- Design (physical appearance of the robots);
- Product qualities (quality of installed components of the Robot-Era System).

The **immaterial components** are:

- Services (services going beyond the physical interaction with the robot);
- Guarantees (product guarantee on safety of the robotic components);
- Trainings (e.g. personal introduction to the use of the robot);
- Pre-sales services (consultation about services, functions and financing);
- After-sales services (like opportunity to call the technical support if problems occur).

Based on the characteristics and weight of each of those components the strategic positioning can be established. The product quality should cover the needs and expectations of the target group. According to this the **perception of product quality** and **personal benefits** are important issues related to the product.

To make sure to match the requirements of the target group of elderly people several empirical studies have been conducted within project (see WP2 and WP8).

The charts below give an overview of the most important functional issues identified during user research and assigned to the different levels of autonomy. **Health, safety** and a **design of household situation tailored to suit actual user needs are the most often articulated needs** (for detailed information see D2.1/D2.2/D2.3).

Bearing in mind that the development of services and functionalities was conducted in a user-centered way, the functions match the most relevant requirements of the target group of elderly people.

But the personal benefit also depends on the **physical perception of the product** – the **design**. To create a pleasant design of the robots a designer created a first sketch, which will be tested and evaluated through the first experimental loop by real users. Strongly connected to the design is the perception of the **quality of product components**. At the one hand the visible components of the Robot-Era platform should be high quality to protect sensitive software and middleware components and to show users that the whole product is valuable. The design and the quality of components are issues often connected with the perception of quality. As users tend to see the robots as a kind of status symbol (see WP2) those aspects are very important from the marketing point of view. To verify the quality of product components objective standards and guidelines are conceivable to increase the perception of potential customers (see also T9.6 within WP9). Besides quality aspects those standards should also ensure the security of the human-robot interaction.

ROBOTERA SERVICES STRUCTURE

HEALTH, LEISURE, PHYSICAL SUPPORT

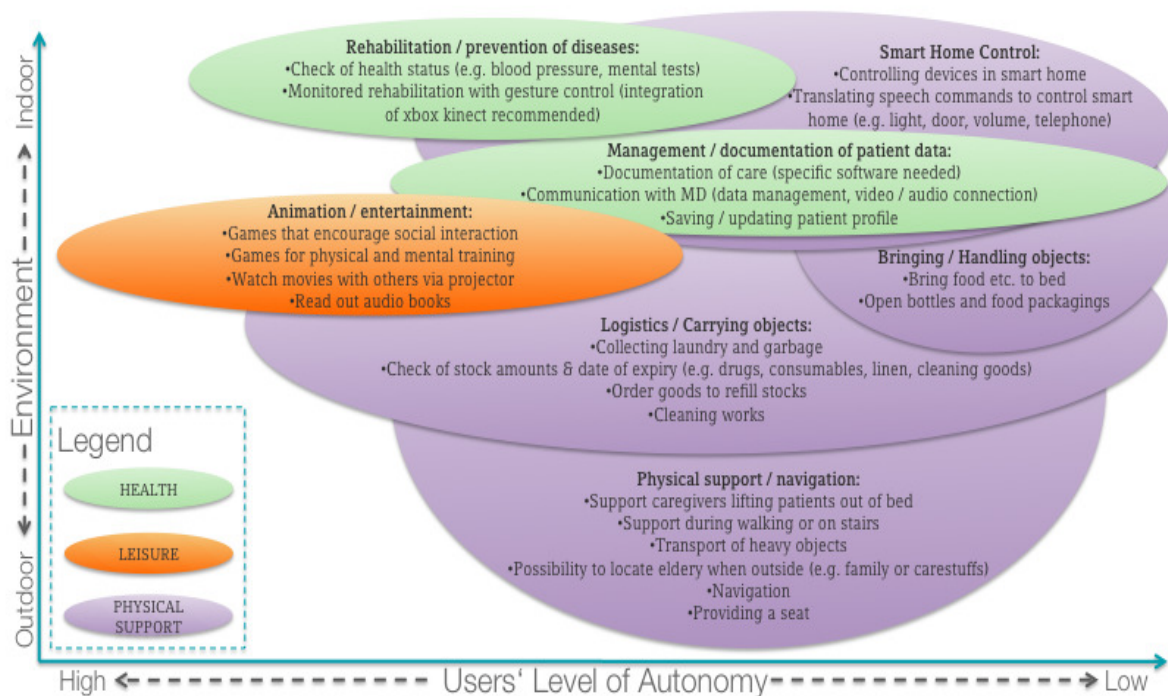


Figure 19. Robot-Era Service Structure. Health, Leisure, Physical support

ROBOTERA SERVICES STRUCTURE

SOCIAL INTERACTION, INFORMATION, SAFETY

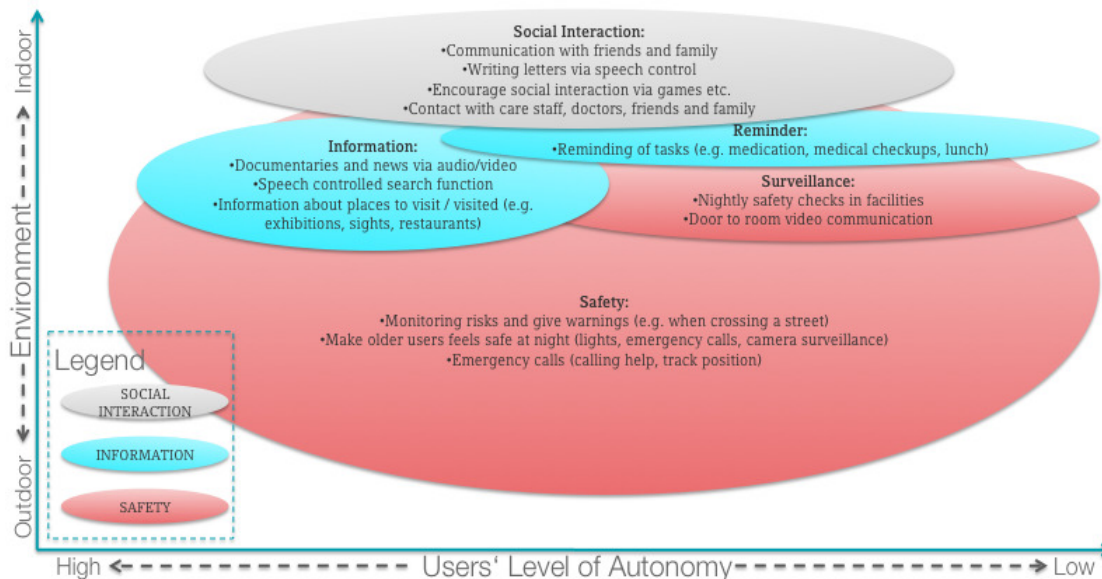


Figure 20. Robot-Era Service Structure. Social interaction, information, safety

Besides the physical product components also the immaterial components do have an important role when creating a marketing model. Elderly people tend to be afraid of using new technology and are afraid of using the technology in a wrong way. So the services along the product need to make sure that these acceptance barriers can be reduced to a minimum.

In addition to the Robot-Era service structure also **pre- and after sales services** should be defined in the near future. Services like **trainings** which show how to use the robot and a technical support seem essential for giving a feeling of safety and for increasing a self-confident usage of a robot by elderly people. Also **professional consultation of secondary service providers or government facilities** should be established to guarantee the accessibility of information regarding the functionalities and funding opportunities of Robot-Era service robots.

Especially when looking at the estimated high investment costs of buying a robotic-system the customer a **product guarantee** should be obligatory when selling the robots.

Putting those aspects together a first positioning draft can be drawn:

As the Robot-Era robots do not have any comparable competitors, it is not necessary to highlight the differences Robot-Era and its competitors. So the focus of the positioning strategies has to be the customer benefit.

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As the Robot-Era robots do not have any comparable competitors, it is not necessary to highlight the differences Robot-Era and its competitors. So the focus of the positioning strategies has to be the customer benefit.

The **positioning** aim in this case is to **find an unoccupied position**. So the distinction will be done directly by the product (the robotic-system) and through services:

- Distinction through the **product**;
- Optional features;

- Performance;
- Design and appearance;
- Product benefits;
- Intended use.
- Distinction through services;
 - Montage and putting into service;
 - Maintenance and repair;
 - Trainings and consulting;
 - Promptness of services.

With regard to pricing the focus should be more on the promotion of good services than only on product features, because those aspects produce a bigger customer benefit and are the basis for a positive customer satisfaction. The positioning strategy should take into account different levels of autonomy of elderly people to not reduce the personal mobility and motivation to perform activities of daily living independent. Users with a high level of autonomy do probably not need the whole service set offered by the Robot-Era system. To match the needs of different levels of autonomies and different health status of users, it is possible to offer **different service modules**, so that the user can individually decide to buy a limited number of Robot-Era services with the opportunity to extend the service set later, if the health status is getting worst. If there will appear competitors on the robotic market in the near future one should consider also to position through the image (of the brand) or the design.

5.9.2 Communication

Marketing communications are messages and related media used to communicate with a market. Marketing communications are the "promotion" part of the "marketing mix" (Kennteth and Back, 2007). Since different groups of stakeholders have different interests and needs, different approaches of convincing these groups to buy and use or at least participate in Robot-Era services have to be taken. In this deliverable, communication to elderly people will be examined, whereas the communication with other stakeholder groups will be considered in the following deliverables.

Particularly elderly persons have so far not been in the focus of companies when planning marketing and communication. But they are a very important target group for Robot-Era: They are the primary users, can on the one hand benefit a lot of robots assistance, but do on the other hand not know much about this technology or are even afraid of using it. Hence, the specific characteristics of this group regarding communication have to be taken into account.

This chapter describes what specific requirements are relevant when communicating with older customers and explains which communication channels can be used to get the right messages to the right people.

5.9.3 Communication requirements of the target group

Specific target groups may have specific characteristics, which have to be respected when communicating with them. These specifics are described below.

From other research projects and secondary research specific requirements regarding communication with older customers are relatively well known: With long experience of life and consumption, elderly target groups are often sensitive, demanding and professional customers. Generally, they like to be addressed as competent customers without pointing at their age related deficits. Older users want clear descriptions of functions and benefits, they like authentic models and situations, and they handle very striking slogans with caution. But besides these demands, elderly target groups have to deal with age-related physiological

changes, which entail even more specific requirements. Afterwards, the most relevant requirements are listed:

- Requirements concerning message and content (Bernd, 2006; Wild, 2005; Meyer, Hentschel and Gundolf, 2004):
 - Describe clear benefits and USP; design informative communication measures that are connected to the daily life of the target groups.
 - Respect the consumption experience of older customers – be authentic and objective (e.g., by involving creditable experts or scientific results).
 - Refer to the target groups in an active, positive, potential-oriented way; avoid clichés, do not reduce elderly to “persons in need of care” or “super fit persons”.
 - Show seniors involved in social networks, interacting with different generations.
 - Mood and ingenious funny messages are allowed, even with older target groups.
 - Avoid foreign and technical terms.
 - Offer easy-to-use touch points, particularly for complex products (free of charge hotline, easy to remember website, easy to reach showroom).
- Requirements concerning design due to physiological and mental age-related changes (Seniorenmarketing 2006).
 - Use a clean layout and good structure.
 - Consider the restricted hearing and lower strength of vision; use good contrast, bigger font size, no small print.
 - Explain your product directly (e.g. on trade fairs or in showrooms), since spoken information is better memorized than written information and the processing of visual input takes longer (Hupp, 1999).
 - Limit the amount of information, since older persons have a decreasing performance of short-term-memory.
 - Try to use consistent communication, since the fluid intelligence is decreasing and thus older people struggle to adapt to changing structure and content.
 - Keep in mind the decreasing mobility – the communication should come to the user, not the other way round.

5.9.4 Communication-Mix for target group elderly people

As already mentioned, a communication-mix, combining advertisement, personal selling, sales promotion, public relations and direct marketing, should be implemented in the Robot-Era marketing strategies. However the elements of the communication-mix need to be weighted regarding the requirements of the target group (see also Description and Definition of the Robot-Era target group). The following paragraph gives an overview of different types of advertisement and provides fundamental information to create a well-balanced communication-mix for elderly people.

One part of the planning of communication actions is the choice of communication channels. Therefore it is fundamental to know what channels the target group uses, and what timing is best to deliver the communication message.

5.9.5 Timing of communication activities

The best timing for communication activities is when a person is changing his/her lifestyle (e.g., when retiring, or with the beginning of health restrictions) or during demanding

travels or sport activities. Also in everyday situations when a person is alone a communication activity can be successful.

5.9.6 Location of communication activities

The placement works best where potential target group members are and where it is easy to get their attention. Advertisements can e.g. be placed in trains or during cruise or music events for active elderly people. For older elderly with a lower level of autonomy, places like waiting rooms at medical centers, care facilities or day care centres will work best (Seniorenmarketing 2006).

5.9.7 Public relations

Keeping in mind that the Robot-Era robots are radical innovations, the first step will be the promotion of the robots through public relations. During all project phases the work done in WP10 will promote activities (e.g. summer school events, open days, media activities on Facebook, TV and public radio) to attract the public. The advantage of using public relations is to evoke interest in the robots abilities and functions, which increases the trust from potential users point of view. At the current project status public relations are the only element of the communication-mix which can be established already now.

5.9.8 Advertisement and direct marketing

Advertisement can be spread over different channels e.g. TV, print-media (newspapers, magazines), radio, internet or outdoor advertising. But which channels do elderly people use?

In general, TV is the most used communication channel in average. The importance of TV increases with age of users (van Eimeren and Ridder, 2011) – but it does not necessarily mean that this channel is the most adequate for marketing. With regard to elderly people, a TV advertisement should contain not more than one or two sales arguments and it should also be a very good structured, concrete and with a high quality graphic interface. Putting the main argument at the end and repeating the spot increases the ability to remember the spot (Härtl-Kasulke, 1998).

Print-media is the medium frequently used by elderly people. While TV advertisement can overtax and stress elderly people to read a newspaper can be something more relaxing. One big advantage of print-media is the opportunity to organize ones time to get the information. In this case the user has enough time to look at products and information without any time restriction. But to create a good print advertisement physiological age related changes (see also Psychological and Physical age-related changes) have to be considered. So the font size of an advertisement for elderly people should never be smaller than 12 and without serifs. Also the use of colors should be reduced to increase the opportunity to create high contrasts, a structured design and less text (Gaubé, 1995).

As **E-mails** and **personal letters** are elements of a direct marketing strategy, the chance to gain interest of the target group of elderly people is high (see also Communication-Mix). E-mails and letters often include a personal form of address and a lot of information. Until today it is not disproved that a several pages long mailing is too much for elderly people – but it strongly depends on the content (Seniorenmarketing, 2006). As long as the content is interesting, easy to understand and provides a benefit for the user it does not depend on the length of the information. But it has to be considered that complexity makes it difficult to follow the information. So it should be proved at the beginning how many elements and information are necessary to be included in the letter or email.

As half of the European (53%) elderly people (55+) listen to the radio everyday (Eurobarometer, 2011), it is also possible to spread information about the robot through this medium.

In contrast to the radio, an **outdoor advertisement** will not reach many people of the target group, especially if the elderly have physical restrictions and low mobility.

Internet as a communication channel will not be that lucrative for distributing information to elderly people at the moment. As 43% of the European retired persons do rarely use the Internet and as 23% of the retired persons do not have access to the internet (household without connection to the internet) this medium is not too frequently used by elderly people, but emerging strongly (Eurobarometer, 2011). The number of persons having access to the internet will increase in the near future, so the opportunity of using the internet as a communication medium for elderly people increases as well.

Personal selling and sales promotion

Personal selling activities should be considered when creating a communication-mix for Robot-Era. Sales pitches at events, congresses, trade fairs and public presentations of the robots could be possible as well. But sales representatives have to be clear and patient to not overload elderly people with too much and complex information. Trust and a personal relationship will increase the chance of a durable cooperation.

The following list, will give first recommendations on the communication-mix and channel regarding to Robot-Era target group of elderly people.

- **HLUA (High level of autonomy)**
 - Advertisement (TV)
 - Print media
 - Personal Sale
 - Direct marketing (Internet, Letters)
 - Places
 - Trains
 - Airplanes
 - Cruise ships
 - Events (concerts, theatre, ...)
 - Fitness, sports courses
- **MLUA (Middle level of autonomy)**
 - In between
- **LLUA (Low level of autonomy)**
 - Print media
 - Direct marketing & personal sales
 - Places
 - Trains
 - Cruise ships
 - Senior homes / care facilities
 - Social institutions
 - Word of mouth
 - Carers, family members

5.9.9 Distribution

To describe a practicable distribution strategy for Robot-Era is difficult because at this point the development of robots is ongoing. The basis for listing potential trading partners to create a supply chain is not given today, since the market is not developed yet. This aspect makes it difficult to select a detailed sales structure. But what can be done during this early development phase is to give an overview of general strategies of distributing a service-robot as a new product on the European market:

Keeping in mind that the production of service-robots demands high investments for the producer, probably only few robots will be sold in the near future. Following this assumption the number of trading partners will be relatively low. So the **supply chain will be not that complex** and will probably contain a restricted number of members. In this case a **direct distribution strategy** will be the best alternative to bring the robots to the market. This strategy aims on reaching target groups like "Innovators" and "Early adopters" as mentioned in the "diffusion of innovation" theory by Rogers (2003). Another important aspect is to keep in mind that a growing number of trade partners also means to increase logistic activities. In the case of a complex and sensitive technical product like a service-robot a reduced number of logistical routes is recommended because of the risk of damages on the product.

Depending on the business model of the Robot-Era robots, it is also imaginable that not only the robot as pure physical product will be offered but **also the combination of the robot and the service** around the robotic activities will be sold. Following this scenario an **indirect distribution strategy** (containing several partners) will be possible, too. In this case the supply chain does not only consist of producers and customers but also contains other stakeholders and service providers like insurances, advisory centers (e.g. for health and personal care) or governmental institutions.

One important when selling service-robots is that the commercial agents directly interacting with the users should provide serious references to create trustful relationships. To give detailed explanation on the use of the robots, a professional background is needed. So the owner of the selling point of the robots should make sure to have competent personal. This argument underlines the choice of a **restricted number of serious and trustful trade partners**. If one put together both scenarios to bring up a distribution strategy a **selective or exclusive distribution** through a **vertical marketing system** can be recommended. In each case a strong and trustful relationship among all trading partners is an important assumption to release service robots.

Next Steps

5.10 Service and Business Models

The deliverable presents a first description of the current service and business models for the related services (shopping delivery; meal preparation; home cleaning and assistance; help for personal hygiene; assisted bathing; assisted dressing; reorganization linen; socialization and entertainment; outdoor chores; assisted getting in and out of bed; assisted outdoor activities; outdoor laundry; chaperone; assisted activities) and a preliminary definition of the Robot-Era service and business models. However, for being closer to reality the service and business model design needs the conclusion of the cost-effectiveness analysis based on the comparison between current and Robot-Era solutions. In the next months we will be able to collect data from final users that are testing the Robot-Era services. This analysis will be formalized once the samples of final users that test robot are at their maximum size (35 units in Peccioli and 35 units in Örebro). Therefore, the completeness of the analysis that will provide all the inputs necessary for completing the business and service model design of Robot-Era service, will follow the experimentation phases of the project.

5.11 Marketing Models

This deliverable gave an overview of marketing needs and requirements of the target group of elderly people. But also other stakeholders have specific intentions regarding the use and the benefits of a robotic system – these will be considered in the subsequent deliverable (D9.4).

As the Robot-Era system consists of three different robots and each robot will fulfill different services and functions it is necessary to describe in detail which robot can match the needs of which target group. For example the outdoor robot will be used mainly for outdoor activities (like walking support, shopping). This robot could be used not only by elderly people but also by younger persons (like sales assistants who will load the robot with food). Also the need of Robot-Era services offered by the robots can differ related to the level of autonomy of users and related to different stakeholder/target groups. For the next analysis of service, business and marketing models, the different needs of each target group/stakeholder group will be considered in detail with regard to each Robot-Era platform (Indoor Robot, Condominium Robot, Outdoor Robot) and service. The results of this analysis aim for creating different service-modules in connection with target group recommendations.

To reach the aim of an integrated marketing model for Robot-Era – including pricing and distribution recommendations – several information's will be generated during the next steps of the project through empirical research. To extend the current marketing model, pricing and financing models will be defined and selected on the basis of the developed business model.



6 Conclusions

The deliverable has presented the activities and the preliminary outcomes in defining the first model of Robot-Era services, in their business, communication and marketing dimensions. This effort has been supported by both the analysis of the service and business model of the current services for the elderly that can be compared to Robot-Era solutions.

New data for comparing the two different socio-cultural environments of Pecicoli and Orebro will be collected and analysed. This information will be very useful to refine the business model of Robot-Era services, also add the financial dimension of the short and long run sustainability of the technological solution proposed.

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Appendix

Business model of Robot-Era services

1 Introduction

This introduction tries to clarify the structure and arguments that form the Robot-Era business model.

A business model consists of three main elements that answer to three questions on the product/service proposal.

- 1) What? That is the product/service (i.e., the supply plan) described by:
 - a) technical characteristics, also considering the complementary services or products associated to the principal one;
 - b) immaterial dimension: the image the product transfers to its owners;
 - c) economic dimension: price(s) of the product and of the complementary services associated, the characteristics of the payment and delivery, the guaranty associated to the product/service, etc.
- 2) To whom? That is the market target group of the product/service proposed.
- 3) How? That is the internal and external structures and actions that should be implemented or used to produce the proposed product/services and meet the selected target group.
 - a) Internal structure means the technical, human and immaterial resources, employed and organized to implement the product solution/service proposed in the market.
 - b) External structure is referred to the communication effort and strategies to meet the potential demand.

In addition to the above elements, there are two main arguments that answer to additional questions:

- 4) Where? The demand is answered through a competition analysis able to define and also choose the market competitors.
- 5) Which found? The answer is based on the definition of the financial structure able to support the internal and external structures and activities implemented. These elements, that form the operative model of the product/service proposal, are the basis for defining the financial model i.e. the definition of the structure of capital for supporting the long run sustainability of the proposal.

The 1-4 main arguments form the business model. The business plan of the product/service proposal considers also point 5 in addition to 1-4 elements.

2 What? The product/service

The proposal is articulated in its technical, immaterial and economic dimensions.

2.1 Technical dimension of the offer

The principal product consists of three different robotic platforms³⁰:

- a) an indoor robot DORO;

³⁰ For more technical details see the description of the singular robotic platform in the technical WPs of the Robot-Era project.

- b) a condominium robot: CORO;
- c) an outdoor robot: ORO.



Figure 1A. Robot Platforms: Doro, Coro, and Oro.

Each platform can act both independently or interact with each other in delivering a set of services.

So the supply system is modular according to the characteristics of the potential adopter and the characteristics of infrastructures in which he or she lives and operates.

The basic supply consists of one robot, a, b, or c, and a set of services.

Some services are robot specific. For instance surveillance at night is an indoor robot-specific service. For other services the specific robot can implement a well defined and separated phase of them. The other phases can be delivered by other robots or using other solutions.

For instance if the potential adopter has both the outdoor robot and he requests a service of garbage transportation, then the garbage collection within the apartment and the garbage transportation from the apartment to the condominium door are activities that he should manage by himself or using alternative solutions. The outdoor activities of the garbage transportation can be implemented by the specific robot.

In short, the technical products offered consist of the following modular solutions:

A singular platform:

- S1) indoor robot;
- S2) condominium robot;
- S3) outdoor robot;

Two platforms:

- D1) Indoor + condominium robot (S1+S2)
- D2) Indoor +outdoor robot (S1+S3);
- D3) Condominium + outdoor robot (S2+S3);

The full packet:

- F) Indoor + condominium + outdoor robot (S1+S2+S3).

The full list of services in the current supply plan is:

- A1) Drug and shopping delivery;
- A2) Garbage collection;
- A3) Communication;
- A4) Surveillance;
- A5) Delivery;
- A6) Laundry;



- A7) Reminding;
- A8) Indoor escort at night;
- A9) Object transportation;
- A10) Walking support.

This list can be also improved with new services in a medium and long run perspective. The supply plan that integrates the robotic platforms and the services is described in Table 1A.

Table 1A. Supply plan

Packet	Robotic platform solutions	Specific services
Platform only	S1) indoor robot; S2) condominium robot; S3) outdoor robot;	
Services only (software)		A1) Drug and shopping delivery; A2) Garbage collection; A3) Communication; A4) Surveillance; A5) Delivery; A6) Laundry; A7) Reminding; A8) Indoor escort at night; A9) Object transportation; A10) Walking support.
Singular platform	S1) indoor robot;	A4) Surveillance; A7) Reminding; A8) Indoor escort at night; A9) Object transportation;
	S2) condominium robot;	A2) Garbage collection; A3) Laundry
	S3) outdoor robot;	A1) Drug and shopping delivery. A2) Garbage collection; A9) Object transportation; A10) walking support.
Two platforms	D1) Indoor + condominium robot (S1+S2)	A2) Garbage collection; A3) Laundry; A4) Surveillance; A7) Reminding; A8) Indoor escort at night; A9) Object transportation;
	D2) Indoor +outdoor robot (S1+S3);	A1) Drug and shopping delivery. A2) Garbage collection; A4) Surveillance; A7) Reminding; A8) Indoor escort at night; A9) Object transportation; A10) Walking support.
	D3) Condominium + outdoor robot (S2+S3);	A1) Drug and shopping delivery. A2) Garbage collection; A3) Laundry; A4) Surveillance; A7) Reminding; A8) Indoor escort at night; A9) Object transportation; A9) Object transportation; A10) Walking support.
Full packet	F) Full packet (3 robots)	A1) Drug and shopping delivery; A2) Garbage collection; A3) Communication; A4) Surveillance; A5) Delivery; A6) Laundry; A7) Reminding; A8) Indoor escort at night;

A9) Object transportation;
A10) Walking support.

Technically speaking, a service is a software that manages and controls the robotic platform to collect information, to interact with human being and the environment, making specific actions and movements.

The smallest packet is a singular platform with a singular platform specific service. However, in some cases, and for particular buyers (e.g. academics), the basic packet can be a singular robotic platform only.

2.1.1 Complementary services

- - A pre-selling assistance of advice and counselling for the best platform and service solutions. It consists of:
 - a first inspection of the environmental conditions and the characteristics of final users of the services;
 - advice of the potential organizational changes and choice of the best solutions (platform(s) and service(s)) according to the inspections and potential adopter wishes.
 - Demos and a very short training are associated to all the packets of the product/services. Training duration changes according to the packets.

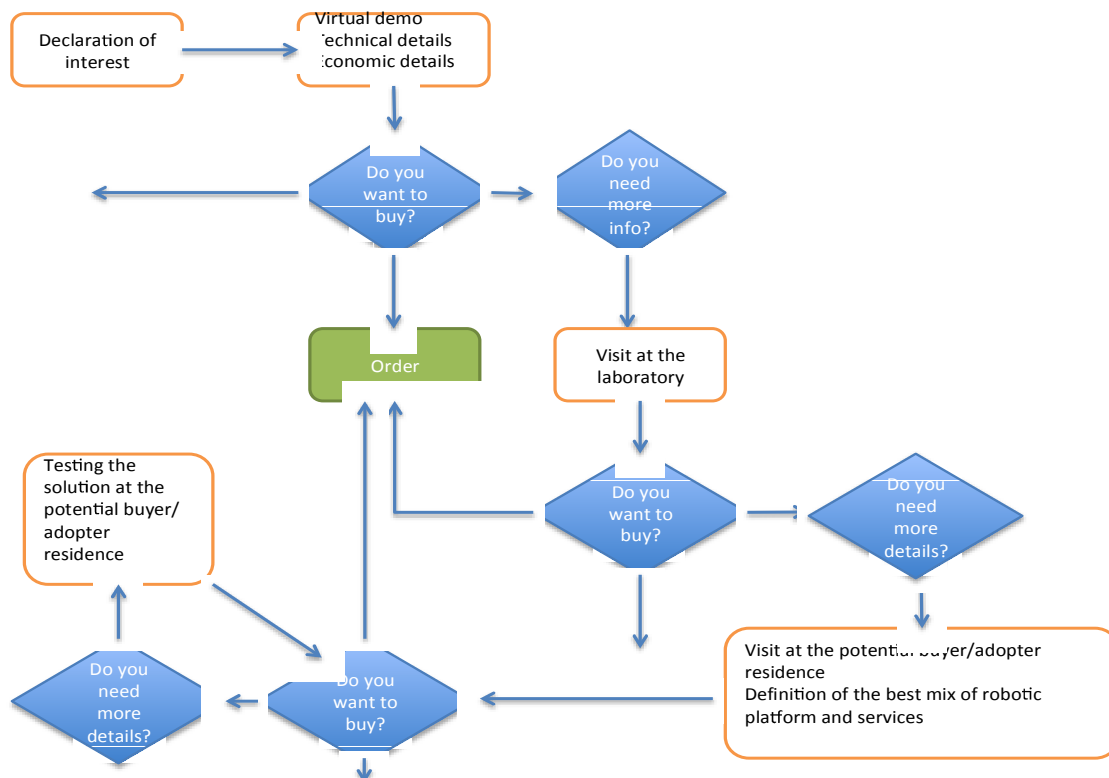


Figure. 2A Pre selling process

- A post-selling assistance:
 - Order execution by one month.
 - An advanced period of post-selling training for adopters. Virtual demo and first virtual demonstration and training start with the order. Training with the robot starts when the order is executed.
 - A service of technical assistance:
 - call center assistance;
 - remote control and remote assistance on the software;
 - visit of technical operators.

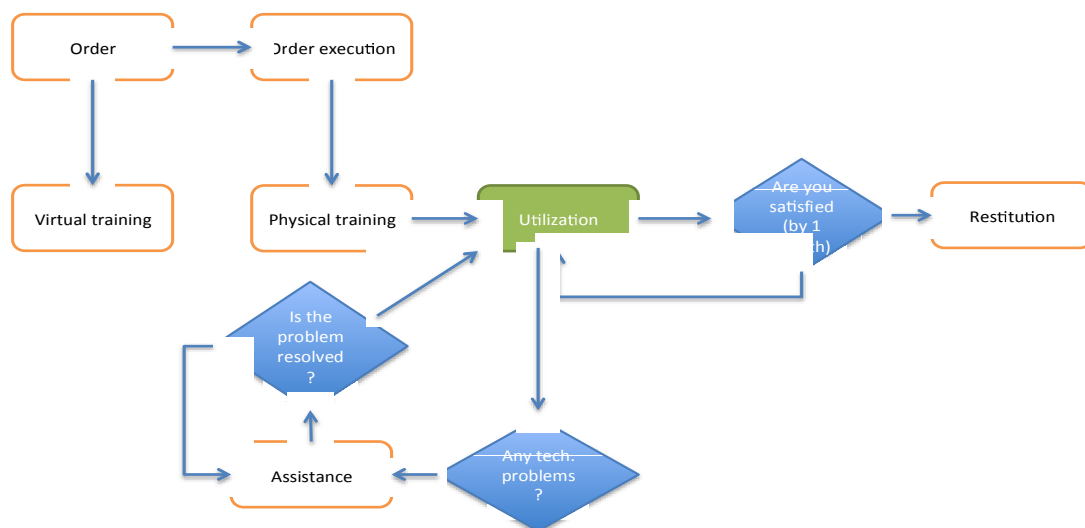


Figure 3A. Post selling process

2.1.2 Immaterial dimensions of the supply

The image that the supply plan offers to the adopter is of organizations and users that are technological updated, that are able to efficiently manage a relative large size of people. The status that the robot gives to the adopter is of an advanced organization able to meet the future wishes.

Since the first adopter will experiment the organization changes generated by the adoption of the platforms and the integrated services, his or her role in the design of future services and technology, because of the information that he or she will collect on his experience, will be pivotal for followers (e.g., organizations final users, technology providers, researchers, etc.)

2.1.3 Economic dimension

The general orientation behind the system of price and, in a broader sense, the economic dimension of the supply, is based on the following price policy.

- 1) The modularity of the proposal indicates both a system of volume discounts and discounts associated to different packets of robotic platforms and services. It means that the sum of prices for separated platforms and service is higher than packets that integrate those platforms and services.
- 2) Payment can be also articulated in a first payment (10% of the total price) for the platform(s) and an installation system for the platforms and the services. For the platform the period of payment is 36 months (3 years).
- 3) A payment delay that depends on the characteristics of the buyer and it differs from platform(s) and service(s) buying.
- 4) A 3-year warranty.
- 5) An adding price for extending the warranty.
- 6) (Possible) a convention with a selected insurer for insuring damages caused by the technology to people and things.

3 To whom? Market target group of the product/service proposed.

The target groups for the supply plan of Robot-Era solutions differ among the specific packets of platform and services.

The selection of the following target groups comes from the general idea that the services are elderly tailored.

The general perspective is based on six main potential adopters.

- University and researchers that may be interested in:
 - the robotic platform(s) for new experiments, research activities etc. (for engineers);
 - platform with some services for researchers that study human-robot interactions (for psychologists and AI researchers);
 - software that controls the platform movement for the services (for engineers and AI researchers).
- Industry that can be interested in:
 - developing some complementary services i.e., new services that can be integrated within the Robot-Era platform.
 - developing some complementary technologies (hardware) for Robot-Era services.
- Organizations of service providers (e.g., service provider cooperative or hospices or rehabilitative centres) that may be interested in S1 or S2-S3 packets or F. The choice of S2 depends to the characteristics of the buildings.
- Municipalities that are potentially interested in S3 packets for garbage transportation;
- Condominiums that may interest in S2 and S3 packet;
- Final users that may be interested in S1 packet and its specific services.



Table 2A. Demand segmentation of the supply plan

Packet	Robotic platform solutions	Specific services	Target group
Platform only	S1		Industry Researcher
	S2		Industry Researcher
	S3		Industry Researcher
Service only (software)		A1) Drug and shopping delivery; A2) Garbage collection; A3) Communication; A4) Surveillance; A5) Delivery; A6) Laundry; A7) Reminding; A8) Indoor escort at night; A9) Object transportation; A10) Walking support.	Industry Researcher All the target groups that bought a robotic platform(s)
Singular platform	S1) indoor robot;	A4) Surveillance; A7) Reminding; A8) Indoor escort at night; A9) Object transportation;	Final users Researchers Industry
	S2) condominium robot;	A2) Garbage collection; A3) Laundry	Condominiums Industry Researcher
	S3) outdoor robot;	A1) Drug and shopping delivery. A2) Garbage collection; A9) Object transportation; A10) walking support.	Municipality Condominiums Organizations Industry Researcher
Two platforms	D1) Indoor+condominium robot (S1+S2)	A2) Garbage collection; A3) Laundry; A4) Surveillance; A7) Reminding; A8) Indoor escort at night; A9) Object transportation;	Municipality Condominiums Organizations
	D2) Indoor +outdoor robot (S1+S3);	A1) Drug and shopping delivery. A2) Garbage collection; A4) Surveillance; A7) Reminding; A8) Indoor escort at night; A9) Object transportation; A10) Walking support.	Final users that live in cottages, small houses or in terraced houses (i.e., the condominium robot is useless) Organizations
	D3) Condominium+outdoor robot (S2+S3);	A1) Drug and shopping delivery. A2) Garbage collection; A3) Laundry; A4) Surveillance; A7) Reminding; A8) Indoor escort at night; A9) Object transportation; A9) Object transportation; A10) Walking support.	Condominiums
Full packet	F) Full packet (3 robots)	A1) Drug and shopping delivery; A2) Garbage collection; A3) Communication; A4) Surveillance;	Condominiums Organizations



- A5) Delivery;
- A6) Laundry;
- A7) Reminding;
- A8) Indoor escort at night;
- A9) Object transportation;
- A10) Walking support.

4 How? Internal and external resources for the supply plan

4.1 Internal structure

4.1.1 Resources for implementing the hardware

The table below reports the hardware components of the robotic platforms and the strategies (make or/and buy or industrial partnership) to produce them.

Table 3A. Make or buy strategies for the hardware components of the products

Product/activities	Make	Buy
Robot TASER for the preliminary phase of the Robot-Era ideation		UHAM
Home facilities for sensor/actuator development.		ORU
The humanoid platform iCub for the initial developmental activities of Robot-Era. Initial developmental activities on language and manipulation learning and integration with the humanoid platform iCub		UOP
Two mobile robotic platforms for developmental and implemental activities of the Robot-Era services. SCITOS G5 is adaptable to almost every application in an indoor environment. It handles payloads of up to 50 kg (110 Ibs) without curtailing the driving performance.		MLAB
Sensor integrations	SSSA	
CAD/CAM/CAE systems for mechanic and electronic design, software development environments for software and firmware implementation, other laboratory equipments such as welding stations, oscilloscopes, logic analyzers, etc. for assembly and testing electronic boards, and a 3D printer for rapid prototyping in ABS of mechanical components.		RoboTech
Integration of components	SSSA	

4.1.2 Resources for implementing the software and services

Table 4A reports the hardware components of the robotic platforms and the strategies (make or/and buy or industrial partnership) to produce them.

Table 3. Make or buy strategies for the software components of the products

Product/activities	Make	Buy	Industrial partnership
Speech recognition and dialog manager		UOP	
Speech production		UOP	
Internet based GUI	UOP		
ROS nodes for general purpose on robot	SSSA (indoor) - RT (outdoor)		
Infrastructure for blackboard communication	ORU		
ROS node for manipulation task	UHAM		
CogniDrive for indoor navigation		MLAB	
ROS node for general robot purpose	SSSA		
Management and planning of tasks	ORU		
Sensor network data management	SSSA		

4.1.3 Resources for the pre and post selling activities

We should distinguish between a short and a long run approach. In effect, strategies for pre and post selling assistance can be outsourced when the number of requests overcomes the organizational capability of the consortium. In a short run perspective the pre and post selling activities will be managed by the consortium to reduce the uncertainty and the high transaction costs the technological solution will generate.

4.2 External structure

4.2.1 Communication

Communication strategies should be differentiated according to the different target groups and the communication channels they privilege.

We can divide communication strategies into the two macro-perspective of B2C (business to consumer) and B2B (business to business) approaches.

Within these two main different approaches in which the communication strategies are placed, the communication plan also makes a distinction between direct and indirect communication, and if the communication channels are virtual or based on a face to face human communication.

We define direct communications if the message directly goes to the target group without intermediaries.

However, considering the high transaction costs derived by the complexity of the technology, the general perspective the communication strategy will adopt is that the virtual channel, too, will be complementary sustained by a human face to face relationship.

4.2.2 Communication strategies in the B2C approach to the market

To increase the potential of perception of a product it is important to highlight the personal benefit of using a product from the users point of view. The target group should be interested in the content of the message – so the message should not only contain information on the product specifics but also evoke attention over design and creativity.

The perspective for communicating the selected Robot-Era solutions to the elderly³¹, is mainly based on a face to face communication, both directly and indirectly. This approach can probably change in a very long run perspective, but up to now, the elderly are not confident with virtual communications and they are very suspicious toward people that are not closed to them.

It means that the best communication channel is probably a face to face interaction and indirect communication. In this the first effort for the service supplier is to communicate Robot-Era services to the elderly's intermediaries such as GPs (general practitioners), families and caregivers.

For target groups that are confident with ICT the virtual channel is preferred because it strongly saves time and costs for transferring messages.

4.2.2.1 Communication requirements of the target group

From other research projects and secondary research specific requirements regarding communication with older customers are relatively well known: With long experience of life and consumption, elderly target groups are often sensitive, demanding and professional customers.

Generally, they like to be addressed as competent customers without pointing at their age related deficits. Older users want clear descriptions of functions and benefits, they like authentic models and situations, and they handle very striking slogans with caution. But besides these demands, elderly target groups have to deal with age-related physiological changes, which entail even more specific requirements. Afterwards, the most relevant requirements are listed:

→ Requirements concerning message and content (Bernd, 2006; Wild, 2005; Meyer, Hentschel and Gundolf, 2004):

- Describe clear benefits and USP; design informative communication measures that are connected to the daily life of the target groups.
- Respect the consumption experience of older customers – be authentic and objective (e.g., by involving creditable experts or scientific results).
- Refer to the target groups in an active, positive, potential-oriented way; avoid clichés, do not reduce elderly to “persons in need of care” or “super fit persons”.
- Show seniors involved in social networks, interacting with different generations.
- Mood and ingenious funny messages are allowed, even with older target groups.
- Avoid foreign and technical terms.
- Offer easy-to-use touch points, particularly for complex products (free of charge hotline, easy to remember website, easy to reach showroom).
- Try to use consistent communication, since the fluid intelligence is decreasing and thus older people struggle to adapt to changing structure and content.
- Keep in mind the decreasing mobility – the communication should come to the user, not the other way round.

31 With respect to the elderly as target groups, a short introduction on the communication plan is in the marketing plan for the Robot-Era services (see D9.2, chapter: Recommendation for Robot-Era Service, Business and Marketing Model, sections, 3.2-3.6).

4.2.2.2 Communication-Mix for target group elderly people

A communication-mix, combining advertisement, personal selling, sales promotion, public relations and direct marketing, should be implemented in the Robot-Era marketing strategies. However the elements of the communication-mix need to be weighted regarding the requirements of the target group (see also Description and Definition of the Robot-Era target group). **For a detailed description see also D 9.2. section „Communication“ (Recommendation for Marketing Models).**

4.2.3 Communication strategies in the B2B approach to the market

In case of the target groups are firms, the communication strategy should be supported by a preliminary effort in relational capitals, built on meetings, industry associations, clubs of biomedical and robotic firms, fairs and exhibitions.

Here we can also insert the communication strategies in case the target groups are firms and/or researcher, i.e., when research and development is the reason why the target group may decide to buy Robot-Era technology and services.

In case of researchers as target group the communication strategies are implemented in the traditional communication channels that researchers adopt to communicate among each other: internet, scientific journals and bulletins, workshops, conferences, posters on boards in institutions and Schools of robotics.

4.2.4 Resources for the communication activities

A specific budget is assigned to the dissemination of Robot-Era project. In case of B2B strategies and when target groups are universities and researchers, communication activities will be performed by the consortium taking advantage of its academic and industrial networks. In case of B2C strategies the consortium will pay for advertising in communication channels and mass media focused on the elderly as target.