



EASYREACH is a Project of the
AAL Program (Call 2009-2)



FOSTERING SOCIAL INTERACTION OF HOME-BOUND AND
LESS EDUCATED ELDERLY PEOPLE

Socio-economic assessment of the developed solutions and set of guidelines for further development

Deliverable No.	D6.3		
Work Package No.	WP6	Workpackage Title	Pilots and evaluation
Authors (per company, if more than one company provide it together)	A. Mosca, G.L. Paoletti, S. Bonfiglio and L. Morganti (FIMI)		
Status (F: final; D: draft; RD: revised draft):	F		
File Name:	EASYREACH Deliverable D6.3 vers 3.doc		
Project start date and duration	01 November 2010, 35 Months		



EASYREACH is a Project of the
AAL Program (Call 2009-2)



Contents

INTRODUCTION	4
PART 1 – SOCIO-ECONOMIC ASSESSMENT	6
1. SOCIO-ECONOMIC ASSESSMENT IN THE SOCIAL CARE SECTOR	6
1.1 USED TECHNIQUES (CBA, CEA, CUA).....	6
1.2 INDICATORS FOR ASSESSING THE OUTCOMES OF SOCIAL CARE PROGRAMS FOR ELDERLY PEOPLE	7
1.2.1 Reduction of loneliness.....	8
1.2.2 Self esteem	8
1.3 BENEFITS GAINED BY OTHER STAKEHOLDERS (SENIOR CENTERS, ASSOCIATIONS, INSTITUTIONS, ETC.).....	9
2. THE PROCESS USED IN EASYREACH FOR THE SOCIO-ECONOMIC ASSESSMENT	10
2.1 WEAKNESSES INHERENT TO CBA AND CEA.....	11
2.2 THE BENEFITS MATRIX.....	13
2.2.1 Quantification of the benefits	15
2.2.2 The benefits for the individual stakeholder and for the overall community.....	17
2.3 THE COST ANALYSIS	18
2.4 DISCOUNTING OF COSTS AND GENERATED BENEFITS.....	18
2.5 SENSITIVITY ANALYSIS	19
2.6 COST- BENEFIT ANALYSIS – THE “SOCIETAL APPROACH”.....	20
3. THE INSTITUTIONAL PERSPECTIVE	21
3.1 THE NEED OF COST SAVING: EXPECTED DYNAMICS OF LONG TERM CARE IN EUROPE	21
PART 2 – GUIDELINES FOR FURTHER DEVELOPMENT	23
1. A BETTER IDENTIFICATION OF THE EASYREACH TARGET USERS	23
2. DESIGN SUGGESTIONS	25
2.1 TO AVOID THE “EASYREACH GHETTO”	25
2.2 SIMPLIFY, SIMPLIFY, SIMPLIFY	25



EASYREACH is a Project of the
AAL Program (Call 2009-2)



2.3	IS GESTURE THE RIGHT INTERACTION MODALITY?	25
2.4	NEW APPLICATIONS	26
2.5	ATTENTION POINTS	26
APPENDIX 1 - INDICATORS OF ICT FOR AGEING WELL OUTCOMES.....		27
A1.1	INDICATORS FOR QUALITY OF LIFE IMPROVEMENT	27
A1.2	INDICATORS AND METHODOLOGIES FOR THE EVALUATION OF THE ECONOMIC IMPACT	28
APPENDIX 2 – PREVIOUS WORKS IN CEA AND CBA		29
A2.1	The TIDE CERTAIN Project.....	29
A2.2	A Cost-Benefit Analysis on assistive devices (Sweden 2011)	30

INTRODUCTION

Socio-economic studies in the area of Assistive Technology are not common and techniques for socio-economic evaluation have not been adapted to this area.

On the contrary there is a need to develop and apply such methodologies in consideration of the demographic trend related to the ageing of the population, of its social, political and economical consequences and of the scarcity of the available resources.

The assistance to the older adults represents a duty of the whole community.

The “Document on the fundamental rights of the European citizens” published in 2000 establishes the right of the older population to live independently and with dignity (article 25) and the right of the people with disability to get assistance for an autonomous life (article 26).

Up to now the family has been the primary informal carer for the older adults; unfortunately the change of its structure – already happening during the last few decades – is causing the inability of the family to continue to play this role. From a wide aggregation of people with horizontal links (brothers, cousins, uncles, etc.) and living in the same town and often in the same house or in neighbor houses we are moving towards a reduced group of people with vertical links only (parents, grandfathers, grand children) more often widely dispersed, living in different towns far from each other due to the different locations of their jobs.

Another important change is represented by the growing number of women participating to the labour market; as a consequence they have less time at home to devote to the assistance of the older members of the family.

The number of older people living alone at home is increasing; as an example in Italy the 27.1% of the 65+ citizens live alone (36.9 % female, 13.6% male)¹.

Moreover the lack of the family as the natural “social network” for the elderly people is among the main causes of their loneliness.

ICT can be employed to fight isolation or relieve carers from some monitoring tasks.

The Associations and the no-profit organizations represent important players in the value chain of the “social care”. In this respect it is essential to realize a harmonized cooperation and integration of the services offered by them and by the institutions, i.e. an effective mix of public and private initiatives.

According to a report published already in 2005², if the care of elderly is kept as today, “the amount of needed beds in specialized structures has to double until 2050 [...]; an additional costs of 40 billion Euros only for the period of ten years has to be planned and funded [...]”. The report concludes that “instead of that, independent living at home should be strengthened.” It is clear the trend to move from institutional care to assistance at home. It offers the opportunity of lower costs and matches the desire of the older citizens of continuing to live in their familiar environment.

¹ Source: Report “OsservaSalute 2009” issued by the Università Cattolica of Rome.

² Bertelsmann Stiftung: (Perspectives for Housing of Elderly) Perspektiven für das Wohnen im Alter - Handlungsempfehlungen des Beirates “Leben und Wohnen im Alter” der Bertelsmann Stiftung, Bertelsmann Stiftung; 2005.



EASYREACH is a Project of the
AAL Program (Call 2009-2)



In any case the final objective will be to leave the elders the possibility of choosing “where”, “how” and “from whom” to receive assistance (in sheltered structures, at home, formal care, informal care, etc.).

From an industrial perspective there is a “service provider’s dilemma”: not enough services result into no consumers; not enough consumers cause the unavailability of service providers to invest in this sector. Alternative approaches have to be explored: a break-through killer-app and/or the building of an Ecosystem for Independent Living.

ICT can help in finding new, effective and sustainable approaches in the social care sector.

In this regard EasyReach by fostering the access to the technology also to elderly people with a very low level of computer literacy and familiarity with ICT devices (the “digitally challenged” people) gives a contribution.

This deliverable intends to perform a socio-economic assessment of the EasyReach proposal (First Part of this document) and provide guidelines for further development and research work (Second Part).

Part 1 – Socio-economic assessment

1. SOCIO-ECONOMIC ASSESSMENT IN THE SOCIAL CARE SECTOR

1.1 USED TECHNIQUES (CBA, CEA, CUA)

Cost-benefit analysis (CBA) and cost-effectiveness analysis (CEA) are techniques widely used in various sectors to support decision making processes. In CBA and CEA the outcomes of a project/program are compared with the involved costs; in CBA benefits and costs are both measured in monetary terms i.e. in money, while in CEA the outcomes are evaluated in non-monetary terms (e.g. in years of life saved, extension of the quality-adjusted life expectancy , etc.).

In healthcare and social care CEA and CBA are used to assess and control resources allocation; given current problems and the continuous ageing of the population, the continued interest in this subject would not be surprising. Benefits are frequently gained from cost avoidance, cost reduction, control of resource allocation, improvement in service quality rather than from revenue enhancement activities.

In the period of a decade, the goal of the healthcare and social care systems has shifted from increasing the access to the services to controlling the rapidly inflating costs. The dilemma today is in containing costs without scarifying the desired benefits such as extended access and quality.

Sometime CEA is a preferred approach in health- and social care since researchers have not yet been able to quantify the social benefits (such as quality-of-life) in monetary terms.

The literature shows a preference of Cost-Benefit Analysis up to 1975; more recently Cost Efficiency Analysis is becoming more popular.

A specific case of CEA is the Cost Utility Analysis (CUA) where the costs are compared with benefits in terms of their utility, usually to the users, evaluated in quality of life measures.

Another important indicator is the “opportunity cost”. Due to the limitation of the available resources, the investment in a program causes often the missed opportunity of getting the benefits offered by another program i.e. causes the loss of a cost opportunity. The objective has to be to minimize the “opportunity cost” or to maximize the benefits of the chosen program.

Unfortunately there are few socio-economic assessments of Assistive Technologies in the literature; according to some analysts³ among the various reasons, we have to include the perception that existing costs and outcomes measures are too inadequate to be useful.

A challenge is to find a consensus in the definition of measurable and scientifically acceptable indicators of the anticipated improved quality of life of users and of the socio-economic benefits for the care systems.

³ J. Persson, H. Brodin – “Effectiveness and cost-effectiveness of Assistive Technologies”, 2000

“Solid evidence on common indicators and statistically significant measurement methodologies are essential to convince policy makers and industry to invest further in wide deployment and uptake of solutions”⁴.

1.2 INDICATORS FOR ASSESSING THE OUTCOMES OF SOCIAL CARE PROGRAMS FOR ELDERLY PEOPLE

Typically the measurement of utility generated by an assistive device should include at least two dimensions: the increase of quality of life and the period in which such increase is maintained (Quality-adjusted Life Years (QALY)⁵); another parameter used is the Disability Adjusted Life Years (DALY⁶).

Among the proposed indicators for the assessment of quality of life we report the ICF scale (WHO: International Classification of Functioning, Disability and Health) and the SF36 International Standards (see also the Appendix 1 of this deliverable).

Quality of life is a psychosocial index used to evaluate the wellbeing of individuals: it is a general term summarizing the main aspects of one’s life and focusing on his/her overall health. Researches have identified the main features for the different demographic groups: as concerns elderly, for example, quality of life also deals with the degree of sensory impairment due to ageing.

World Health Organization has developed a specific questionnaire to assess elderly quality of life. WHO defines “Quality of Life” as “the individual’s perception of his or her position in life, within the cultural context and value system he or she lives in, and in relation to his or her goals, expectations, parameters and social relations” (Orley and Kuiken, 1994). The WHOQOL-OLD module consists of 24 Likert-scaled items assigned to six facets: “Sensory Abilities” (SAB), “Autonomy” (AUT), “Past, Present and Future Activities” (PPF), “Social Participation” (SOP), “Death and Dying” (DAD) and “Intimacy” (INT). Each of the facets has 4 items, thus for all facets the score of possible values can range from 4 to 20, provided all items of a facet have been completed. The scores of these six facets or the values of the 24 single items of the

⁴ “Developing Indicators and Impact Assessment Methodologies on ICT for Ageing Well” – Workshop results- Brussels Oct. 19, 2009 – European Commission – ICT PSP

⁵ Quality-adjusted life years (QALY):

The number of life years are weighted according to a quality index (0= death; 1= healthy life); the weights are defined by considering statistical data in groups of people with similar problems and are objective, i.e. take into account objective criteria rather than a personal perception of quality-of-life.

On the contrary Quality-of-Life (QOL) is a subjective parameter and is calculated by using surveys; in healthcare popular tools (Health-related Quality of Life, HRQOL) are the following ones and include emotional, social and physical well being:

- Short form health survey (SF-36) (1993),

- Sickness Impact Profile (1975),

- Symptom States Scales such as the Faces Pain Scale (1988), the Fatigue Scale (1993) or the Functional Independence Measure Scale (1987).

⁶ Disability-adjusted Life Years (DALY):

It is calculated as (YLL + YLD) where YLL represents the number of years of life lost calculated on the basis of the life expectancy and YLD represents the number of years lived with disability (weighted depending on the level of disability).



EASYREACH is a Project of the
AAL Program (Call 2009-2)



WHOQOL-OLD module can be combined to produce a general (“overall”) score for quality of life in older adults, denoted as the WHOQOL-OLD module “total score”.

In EASYREACH we focused on parameters linked to the psychological and emotional wellbeing of the elderly persons (reduction of loneliness, self-esteem, quality of life); they aim at assessing the psychosocial factors that the social interactions fostered by EASYREACH may have changed.

1.2.1 REDUCTION OF LONELINESS

Social relationships are at the core of our life: we all need and desire to feel integrated in a net of subjectively meaningful relationships. Loneliness is a social condition of isolation from other people, but it is not more important than feeling lonely. In fact, elderly people often feel lonely even if they have a family and a group of friend. Subjective loneliness describes people who feel a disagreeable or unacceptable lack of meaningful social relationships. The EasyReach project aims at strengthening the social networks of the elderly persons and the reduction of the perception of loneliness is the most improvement expected.

To assess loneliness the Italian Loneliness Scale (Zammuner, 2008) could be used : it includes items from the UCLA Loneliness Scale (Russell, Peplau and Cutrona,1980) and from the Loneliness scale by De Jong-Gierveld & van Tilburg (1999).The ILS is composed of three subscale: Emotional Loneliness, Social Loneliness and General Loneliness. The Italian scale included 2 extra criterion measures characterizing the unhappiness and the contact with friend in the last 7 days.

1.2.2 SELF ESTEEM

By allowing the older adults to share their competences with peers, the EasyReach system intends to enhance elderly self-esteem and a more positive “perception of the self”, as well as a public appreciation by peers.

Self-esteem is crucial among elderly: most of them experience depressive mood as age grows, mostly because of reviewing their life and not be as satisfied as they would like. Elderly may also feel the guilt of being a burden for the family, if they have lost their autonomy.

To assess self-esteem, the Rosenberg Self-Esteem Scale (Rosenberg, 1965) in its Italian translation made by Prezza (1997) could be used . It is a 10 item measure made up of 4-point Likert scale - from “strongly agree” to “strongly disagree”. The scale ranges from 0-30. Scores between 15 and 25 are within normal range; scores below 15 suggest low self-esteem.



EASYREACH is a Project of the
AAL Program (Call 2009-2)



1.3 BENEFITS GAINED BY OTHER STAKEHOLDERS (SENIOR CENTERS, ASSOCIATIONS, INSTITUTIONS, ETC.)

Senior Centers and Associations will benefit from EasyReach in terms of a better connection with their members, mainly with those having problems (both physical and psychological) in establishing a rich interaction with the community and risking a social isolation.

Through EasyReach they are enabled and motivated to participate to the life of the Association even if remotely, when – permanently or temporally – they are forced to stay at home.

Furthermore the EasyReach platform can be used to organize activities, to inform the members about new initiatives.

Obviously there is not a monetary benefit for the Associations but just the opportunity of better exploit their mission; an indicator of success could be the number of members continuing to actively participate to the life of the Association /Senior Center even if remotely.

The Institutions have a twofold interest in a service such as the EasyReach one:

- a. To foster the social inclusion of the elderly persons including those who are difficult to be reached due to their lack of familiarity with ICT devices / services and therefore are excluded by the opportunities offered by the today's digital society. The psychological and emotional involvement of these persons not only contributes to their mental wellbeing but is an effective tool for preventing and/or delaying their physical decay and for promoting a satisfactory health status.
For the institutions it means reduction in costs for hospitalization due to the occurrence of critical episodes, need of transfer in sheltered homes; it is in line with the today's strategies of moving the care and assistance of the older adults towards the home setting as much as possible.
- b. To establish a tool accessible also to the "digitally challenged" portion of the senior citizens for the introduction of new services on line i.e. for fully exploiting e-government policies without excluding from them a significant part of the population.

2. THE PROCESS USED IN EASYREACH FOR THE SOCIO-ECONOMIC ASSESSMENT

The following diagram shows the overall process we followed for the socio-economic assessment

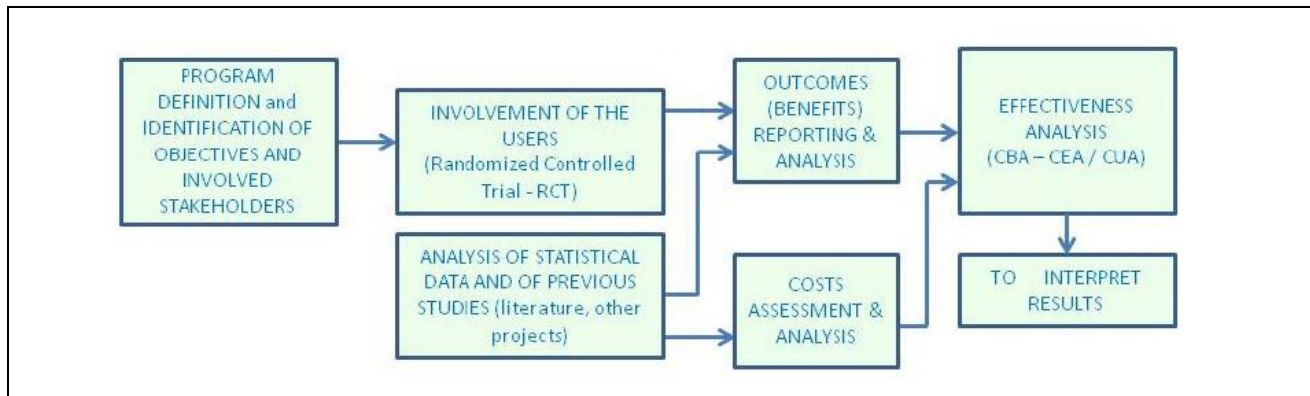


Fig. 1 – The socio-economic assessment process in EasyReach

In the analysis we followed a “societal perspective” where we included all the costs and benefits no matter who bears the costs and who receives the benefits. It is possible to take a more narrow view and make a calculation - for instance – for the elders and their families disregarding the costs and benefits to others who may be affected or – on the contrary - to focus on public sector alone and disregard the older users.

The main contributors of the overall “societal” benefit are:

- a. The saving in the time spent by the family members and by the social operators (reduced visits and reduced time per visit linked to the beneficial effect on the health status of the elder of his psychological wellbeing and his engagement). The saved time can be used to provide assistance to more people i.e. to allow – at equal overall cost – the access to the home care services to a larger portion of the older population;
- b. The economic opportunities gained by the social care sector (ICT devices industry and extra working opportunities in the sectors of the e-care services);
- c. The saving related to a reduced need of residential care i.e. the opportunity of moving from institutional care to a less expensive home care solution supported by the technology (obtained by slowing down the physical and cognitive decay of the elderly).

The **involvement of the user** allows to assess the impact of the project / program when non-monetary indicators are used (e.g. those linked to the acceptance by the users and to the quality of life).

The outcomes of the program are compared with the initial situation derived through surveys (the same type of surveys that will be submitted after the conclusion of the trial); they are contextualized and compared with the expectations of the elderly persons, the family, the informal and formal carers and with the objectives of the whole community.

The **Cost Analysis** includes direct costs and indirect costs such as:

- Equipment / devices (purchasing cost, amortization, technical duration of the equipment vs. the duration of its use),
- Communication costs (Internet access),

- Service fee,
- Training costs,
- Installation costs,
- Maintenance and technical assistance costs.

Discounting has to be applied to adapt the costs and the value of the benefits to their evolution in time.

For both the Costs and Benefits Assessment it is important that :

- all the stakeholders are identified and the costs and benefits for each of them allocated,
- all the costs and benefits (including the “intangible” ones) are considered even if some of them are hardly quantifiable,
- a “sensitivity analysis” is performed to define how the outcomes could change under different scenarios.
- the benefits are prioritized and those with the higher priority deeply analyzed,
- discounting analysis for the benefits measured in monetary terms is done,
- “sensitivity analysis” to define how the outcomes could change under different scenarios;
- in case of CEA, the effectiveness indicators are selected appropriately.

2.1 WEAKNESSES INHERENT TO CBA AND CEA

Experts evidenced some heavy weaknesses in general Cost-Benefit and Cost-Effectiveness analyses and specifically in those applied to e-health and e-care:

Table 1 – Weaknesses in CBA and CEA

Issue	Description
Quantifiable objectives (outcomes)	For a good CEA / CBA the principal objectives should be quantifiable; when that is not possible, reasonable proxies should be available; Unfortunately in health- and social care some objectives are intangible; it is important to avoid the temptation to forget them and to measure only the quantifiable objectives.
Technological changes	Costs and benefits of new and not yet existing programs / technologies are difficult to predict (AAL is an example); Changes in the technological scenario have to be taken into account.
Immaturity of the methodology	In some aspects CEA and CBA methods are still immature. It is missed a scientifically accepted measurement of the anticipated improved quality of life for the user and of the socio-economic benefits for the care system.
Attribution problem	Sometimes it is difficult to separate the changes attributable to the interventions being studied and those that are the result of other influences. It is therefore important to provide evidence that ICT solution makes an independent contribution to the outcome.



EASYREACH is a Project of the
AAL Program (Call 2009-2)



Issue	Description
Selection / eligibility criteria of trials /interviews / participants to surveys	Typically volunteers are used (also for ethical reasons); these likely are positive about ICT interventions. The information about refusal rates at point of initial referral are not always recorded; thus it is not possible to take into account the selection bias in the results.
Often Quality of Life is a too generic outcome indicator	<p>There is general agreement that quality of life requires a comprehensive assessment, meaning that measurement should not be limited to physical and functional capacities alone. Physical health and day-to-day functioning, psychological well-being, social relationships and environment should be taken into account when determining the impact of ICT on Quality of Life. Health status, safety, independence, loneliness, anxiety, relationships with family members these are only a few examples of quality of life predictors that ICT may have an impact on.</p> <p>Subjective approach: to take into account the users' feedback raises problems due to the subjective judgments of quality of life made by people involved in trials: for example users' expectations influence appraised quality of life; also individuals may feel constrained because of courtesy or intimidation from actually expressing their views while taking the survey. The intimidation is more likely if the person is in vulnerable health and perceives himself or herself as dependent on care providers.</p>



EASYREACH is a Project of the
AAL Program (Call 2009-2)



2.2 THE BENEFITS MATRIX

Note: For some parameters a quantitative evaluation of the benefit is given; the explanation is provided in a separate table.

Table 2 – Stakeholders and Benefits in social care services

Stakeholder →		Older adults	Family members – Informal carers	Institutions National / Local Social Care Services	The OVERALL COMMUNITY	The Business Community ⁷	Associations Senior Centers
Benefit ↓		(primary users)					
Participation	Social Inclusion						
Self esteem	Increased life satisfaction and increased self esteem						
Security	Better feeling of security (feeling not alone) - Reassurance						
Health	Reduced or delayed decay of the cognitive functioning						
	Avoidance or reduction of depression, loneliness, anxiety						
	Healthcare prevention						
	Reduced needs of consultation with GPs and specialists (ambulatory and at home visits) due to a better psychological status			160 Euro per year (1)			

⁷ The specific benefits of the players in the AT industry deriving from the integration of multi-vendor services into the OASIS platform will be analyzed in a separate section of this document.



EASYREACH is a Project of the
AAL Program (Call 2009-2)



Stakeholder →		Older adults	Family members –	Institutions	The OVERALL COMMUNITY	The Business Community ⁷	Associations
Benefit ↓		(primary users)	Informal carers	National / Local Social Care Services			Senior Centers
Social care	Reduction of the need of residential care (e.g. transfer to Elderly Homes) again due to a better health status fostered by a psychological and emotional wellbeing.		300 Euro at yearly level (2)	1,320 Euro at yearly level (2)			
	Reduction of the time spent by social operators		52 hours/year = 2,200 Euro (3)				
Family	Peace of mind for the family members						
	Reduction of the burden of care on family members and reduced loss of their working hours		52 hours/year = 450 Euro (4)				
Industry	New opportunities for the Assistive Technology industry					208 Euro per year per user (5)	
e-governance	A tool for extending to all the population e-government services and avoiding the creation of “special services” for the “digitally challenged” citizens			40 Euro/year (6)			
Associations	Better communication with all the members of the Association						
	Programming and communication of initiatives						

2.2.1 QUANTIFICATION OF THE BENEFITS

Table 3: Calculation of the monetary value of the main benefits

Ref.	Type of benefit	Value in Euro at yearly level	Explanation
1	Reduced needs of consultation with GPs and specialists (ambulatory and at home visits)	100 Euro / year due to less consultations and 60 Euro/year due to saving in time per visit	<p>According to the outcomes of previous studies, the number of consultations with the <i>general practitioner</i> will decrease due to the implementation of eCare services. A report published in 2010 (J. Van Ooteghem, A. Ackaert, S. Verbrugge, D. Colle, M. Pickavet, P. Demeester – “Economic viability of eCare solutions”) estimated a 20% decrease in costs related to patients older than 65 for the GP (of which 5.9% for in practice consultations and 14.1% for home consultations). Due to a more efficient approach when eCare services are available, time for <i>home care</i> visits could be saved. This can either lead to a lower number of consultations per patient or in a more efficient visit. The total amount of time savings per patient per year i.e. less consultations and savings in time per visit is estimated at 198 and 122 minutes, respectively (see report mentioned above).</p> <p>By considering an average monthly salary of GPs of 4336 Euro (value valid for Italy – source: ISTAT) for a total of 152 hours/month (38 h / week), we obtain a saving of approx. 100 Euro/year for less consultations and of 60 Euro/year for saving in time per visit.</p>
2	Reduction of the need of residential care	300 Euro for the older adult and/or his/her family; 1,320 Euro for the institutions	<p>We used the outcome of a study conducted in UK (“Better support at lower cost” – Improving social care in Wales” – April 2011; www.ssiacymru.org.uk) indicating a reduction of 5% of the need of residential care through the use of Assistive Technology.</p> <p>With regard to the costs we used the data – valid for Italy and reported by E. Petazzoni indicating a yearly cost for an older adult admitted to residential care of 32,400 Euro (2,700 Euro/month) of which 6,000 Euro (500 Euro/month) paid by the user or the family, 12,000 Euro (1000 Euro/month) by the local authorities (municipality) and 14,400 Euro (1,200 Euro/month) by the National Health Service.</p>
3	Reduction of the time spent by social operators and nurses	2,200 Euro	<p>By using the data of a previous study done in Sweden we consider a reduction of 1 hour per week and we applied the hourly cost for domiciliary assistance applicable in Italy of 42 Euro (Ref. E. Petazzoni : Case history 1 – Experiences in the field of the domiciliary assistance – (in Italian)). It is worthwhile to notice that as an average the hours spent for domiciliary assistance to the elderly patients is in Italy of 272 hours; it means that the considered reduction as effect of the use of AT devices / services is equivalent to approx. 20%.</p>
4	Reduction of the lost working hours by the family members	450 Euro	<p>By using the data of a previous study done in Sweden we consider a reduction of 1 hour per week and we applied the average monthly salary of 1300 Euro valid in 2010 for the Italian citizens (Source: ISTAT 2011).</p>

Ref.	Type of benefit	Value in Euro at yearly level	Explanation
5	New opportunities for the Assistive Technology industry	208 Euro per user per year	<p>The costs spent for the EasyReach services will generate new labour opportunities (Assistive Technology Industry, Social Care) that can be estimated on a yearly level as below indicated:</p> <p>Hardware : gross margin of 35% (price minus material costs) = 88 Euro; Other : average personnel cost equal to 80% of the price = 120 Euro</p> <p>Yearly cost of hardware (remote control & set top box): 500 Euro / 2 = 250 Euro (2 years amortization); Service (maintenance, Internet access, server hosting, other): 150 Euro at yearly level</p>
6	Extension of e-government services to all the citizens	40 Euro per user per year	<p>According to a study done in Italy by the School of Management of the Politecnico di Milano (2012) the overall saving for the Italian municipalities thanks to the introduction – even partial - of e-government could be in the range of 2.3 Billion Euro per year i.e. of approx.. 40 Euro per citizen.</p> <p>Since the “digitally challenged” portion of senior citizens is equal to approx. 30% i.e. to roughly the 7% of the overall Italian population, the possibility of extending the e-government services to this category of citizens will bring a benefit in Italy of 7% of the above mentioned amount, i.e. approx. 160 million Euro per year.</p>

2.2.2 THE BENEFITS FOR THE INDIVIDUAL STAKEHOLDER AND FOR THE OVERALL COMMUNITY

The following table summarizes the benefit at yearly level for the individual stakeholder groups (the older adult and his/her family), the institutions and the overall community.

Table 4 - Quantified benefits at a yearly basis (Values in Euro)

Type of benefit	The older adult and his/her family	The Institutions	Business community	The whole community
Reduction of the time spent by social operators	2,200			2,200
Reduction of the need of residential care (e.g. transfer to Elderly Homes)	300	1,320		1,620
Reduced loss of working hours of the family members	450			450
New opportunities for the Assistive Technology industry			208	208
Reduced need of consultations with GPs and specialists and reduced number of home visits		160		160
e-government services extended also to digitally challenged citizens		40		40
T O T A L	2,950	1,520	208	4,678

2.3 THE COST ANALYSIS

A cost analysis for EasyReach is reported in the following table

Table 5 - Costs

Type of cost	Value (Euro)	Note
Equipment (H/W)	250	Set top box : 350 Euro; Remote control unit : 150 Euro; Amortization over 2 years; yearly amortization quota: 250 Euro
Service (yearly fee)	150	Including quota for server hosting, Internet access (10 Euro/month), maintenance, training
TOTAL YEARLY COSTS	500	

2.4 DISCOUNTING OF COSTS AND GENERATED BENEFITS

We assume a dynamics of the costs as below indicated:

- For the first five years from the market introduction (in the table considered 2015 just for reference):
8% price reduction per year;
- In the period 2020-2040: an average price reduction of 4% per year.

At the same time the additional benefit for the overall community that was calculated equivalent to 4678 Euro will be adjusted accordingly (8% reduction in benefit per year) as indicated in the following table:

Table 6 – Discounting of costs and benefits (Values in Euro)

	Base 2015	2016	2017	2018	2019	2020	2030	2040
Yearly Costs	500	460	423	390	358	330	220	150
Yearly Benefits	4678	4304	3960	3643	3351	3083	1339	582

2.5 SENSITIVITY ANALYSIS

Even if not applied directly to the EasyReach case we report some general notes related to the sensitivity analysis in CEA and CBA.

Sensitivity analysis is the examination of an uncertain event under different assumptions; it assesses the impact on the cost-effectiveness ratio when varying the baseline assumptions across a range of plausible values. Sensitivity analysis provides insight into the stability of the cost-effectiveness ratio, identifies those baseline assumptions that have the greatest impact on overall costs and defines boundaries beyond which a specific project / program may no longer be cost-effective.

In our case uncertainty exists and the following aspects have to be considered in a sensitive analysis:

- Change of personal habits, interactive environmental conditions;
- persistency of low income and poverty among older people;
- general economic situation blocking the investment of the Governments in the social care area;
- unforeseeable technological developments;
- the value of the discount rate;
- Evolution and costs of new social care approaches;
- The evolution of the “digital divide”;
- The role of the migrant workers in the “social care” scenario of the coming years.

It is important to place the results obtained from the analysis in perspective, to examine closely the assumptions upon which the analysis rests and to test the sensitivity of the results to reasonable changes in these assumptions.

Uncertainty can be classified into that which is due to random events and that which is due to lack of information (e.g. uncertainty is due to future events over which we have no control in which case the best we may be able to do is to examine trends or use expert opinion).

For random events, probability theory can be used. When probabilities are not known, expert judgment can be substituted. Thus, without knowing the cause or even the dynamics of a given random process, the analyst can attempt to predict the likelihood of an outcome. Other techniques from the field of operations research such as Monte Carlo and Markov Chain methods could be applied.

As an example, with regard to discounting, we have to conclude that the precise discount rate is unknown and that a consensus may never be reached. Under this uncertainty, one logical course for the analyst is to test the sensitivity of the results to several discount rates (a low, high, and middle value).

2.6 COST- BENEFIT ANALYSIS – THE “SOCIETAL APPROACH”

As previously indicated, we used a “societal perspective” where we included all the costs and benefits no matter who bears the costs and who receives the benefits.

The societal perspective represents an appropriate basis for avoiding suboptimal decision making and for priority setting.

Table 7 – CBA analysis and evolution over time

Societal approach (per person and per year – Values in Euro)				
	Base (2015)	2020	2030	2040
Cost	500	330	220	150
Benefit	4678	3083	1339	582
Benefit/ cost quotient	9.3	9.3	6.1	4.0

The effectiveness of the solution is clearly demonstrated.

The main contributors of the overall “societal” benefit are:

- a. The saving in the time spent by the social operators (reduced visits and reduced time per visit);
- b. The saving related to a reduced need of residential care i.e. the opportunity of moving from institutional care to a less expensive home care solution supported by the technology.

From a “societal perspective” the investments will be recovered in less than 2 months already starting from the 1st year.

3. THE INSTITUTIONAL PERSPECTIVE

3.1 THE NEED OF COST SAVING: EXPECTED DYNAMICS OF LONG TERM CARE IN EUROPE

The demographic trend towards the aging of the population in Europe highlights the importance of understanding the possible future scenarios with regard to the costs of social care services.

According to the “2009 Ageing Report: Economic and Budgetary Projections for the EU-27 Member States (2008-2060) – “European Economy”, 2009 issued by the European Commission, three scenarios can be considered:

A. PESSIMISTIC SCENARIO

People live more time and the percentage of the 65+ population grows; in spite of the advance in medicine, there is no change in the index of independency and disability. In this case we could expect the following dynamics

Table 8a – Evolution of social care costs : A “pessimistic scenario”

	2007	Delta 2007-2060	2060	Non self-sufficient elders	
				2007	2060
EU-27 Social care Costs	1.2% of GDP	103%	2.5% GDP	20.7 million	44.5 million
For ref. Italy	1.7% of GDP	86%	3.1% GDP	2.5 million	5.1 million

B. OPTIMISTIC SCENARIO

There is an improvement in the independency of the older citizens and the disability index will decrease too.

Table 8b – Evolution of social care costs : An “optimistic scenario”

	2007	Delta 2007-2060	2060	Non self-sufficient elders	
				2007	2060
EU-27	1.2% of GDP	85%	2.3% GDP	20.7 million	39.3 million
For ref. Italy	1.7% of GDP	69%	2.8% GDP	2.5 million	4.4 million

This seems a hypothetical case; available data on the independency and disability indexes are not clear and change depending on the countries (in some countries such as Australia there is no change and in other ones such as Japan and some European countries there is even a worsening of the situation).

By mediating all these factors the Ageing Work Group Population and Sustainability (AWG) of the European Commission elaborated a more realistic scenario resulting in the following dynamics

Table 8c – Evolution of social care costs : A “realistic scenario”

	2007	Delta 2007-2060	2060
EU-27	1.2% of GDP	94%	2.4% GDP
For ref. Italy	1.7% of GDP	77%	3.0% GDP

C. THIRD SCENARIO

The third scenario takes into account the change in the family structure and its reduced ability to provide care to the older adults; we expect a heavier involvement of the institutions i.e. a movement from the “informal care-oriented” approach of today (“family-based care”) towards a more “formal care” approach managed by the Institutions. The objective will be 50% of assistance done in sheltered homes / hospitals and 50% of assistance at home (in both cases under the control and the cost of the Institutions).

In this case we will have the following scenario:

Table 8d – Evolution of social care costs : Different scenarios according to various mix of home-based and institutional care

	2007	2060		
		100% Home care	Mix of home care and institutional care	100% Institutional care (nursing homes)
EU-27	1.2% of GDP	2.6%	2.8%	3.1%
For ref. Italy	1.7% of GDP	3.6%	3.9%	4.2%

Part 2 – Guidelines for further development

1.A BETTER IDENTIFICATION OF THE EASYREACH TARGET USERS

The basic concept of EasyReach relies on the realization of a solution allowing the access to specifically designed Internet services to people with a very low level of familiarity with the ICT devices / solutions and reluctant to learn how to use them. It is not only a question of objective difficulty in the use of such devices; often the main reason is a “psychological barrier”, a kind of “technophobia”.

By employing familiar devices such as a TV set and a remote control i.e. non PC-based tools EasyReach helps to overcome the physical impediments (e.g. linked to the use of keyboard and mouse or to the small screen of PCs) and the psychological barriers.

In terms of offered services EasyReach was designed mainly for the older adults and in the current configuration is aiming at satisfying the need of inclusion (communication, participation, belonging) and of information / interaction with the external world.

In consideration of its focus on socialization, the main users are those at risk of isolation such as the elderly persons living alone and forced to stay at home (for physical or other reasons) even if temporally.

Less evident is the “assistance / support” objective of EasyReach for these people (e.g. the “calendar” / “reminder” application).

Therefore in few words we can conclude that the target users for EasyReach are:

The senior citizens who are not using the PC (in some cases due to physical impediments) and find difficult (often due to a kind of psychological barrier) to begin to learn how to use it.

The fig. 2 shows the two main groups of EasyReach users:

- a. The “digitally challenged” mainly if with a low level of social mindset that increases the risk of their isolation,
- b. The people having physical impediments and unable – regardless of their computer literacy – to deal with the keyboard, the mouse or the small screen of a PC.

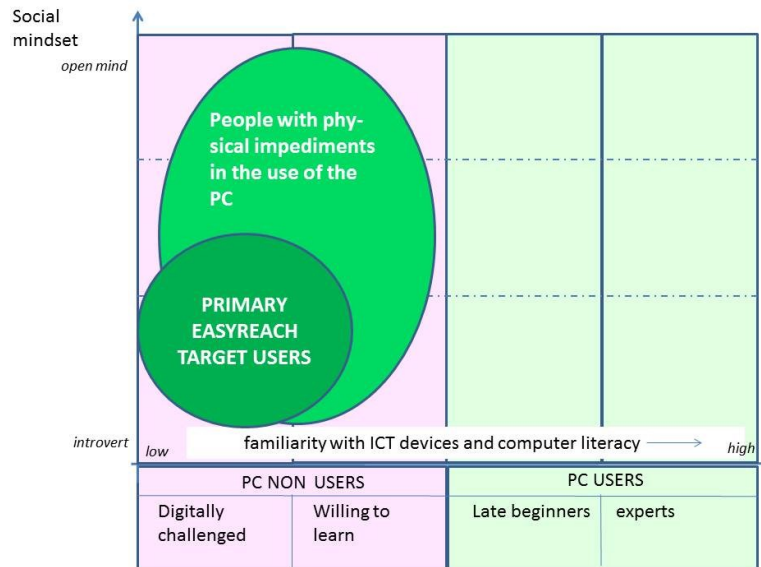


Fig.2 – Main user groups for EasyReach

For them the main added value of using EasyReach will be the enrichment of the social network and the avoidance of loneliness; the main beneficiaries will be homebound people living alone; for them EasyReach will represent the window to the external world.

Further research is needed to try to quantify this segment of potential EasyReach users and understanding its dynamics; in fact the boundaries of this group are very open (new entering people due to new events obliging them to stay at home and to live alone, incoming impediments in the use of the PC; increased computer literacy in the population reducing the number of “digitally challenged” people ; people increasing their “introvert” condition and refusing any contact with the society, etc.).

It is interesting to highlight that in year 2007 the 62% of the people with age in the range of 50-59 years were expert PC users (see deliverable D7.5 “Exploitation Strategy”); these people will have 63-72 years in 2020 and 73-82 years in 2030 and will increase the number of senior citizens having familiarity in the use of the PC; for them the use of EasyReach solution has no value unless physical impediments will block them to use keyboard and mouse.

In general we could expect a reduction of the EasyReach addressable market.

Nevertheless we have to consider the attractiveness of the EasyReach solution linked to the large screen of the TV set (compensating for the growing vision problems of the older adults) and the simplicity of the graphic user interface matching the “simplified reasoning model” of the older adults.

2. DESIGN SUGGESTIONS

As a result of the discussions had with the elderly users and with the specialists (pilots executed in Rome and Milano – see deliverable D6.2 “Report of the pilot results”) several suggestions came out; they need to be deeply considered and taken into account for further development in EasyReach.

Here below we report the most relevant ones.

2.1 TO AVOID THE “EASYREACH GHETTO”

Currently the main limitation of the EasyReach system is its lack of interoperability with standard PC-based systems.

There is the need to have the EasyReach system usable also with a standard PC or a smart phone; it will allow the communication and interaction between the typical EasyReach users and the rest of the society.

The consequence of the lack of interoperability could be the creation of a “EasyReach ghetto” i.e. the isolation of the digitally challenged people in their world and their isolation from the “non EasyReach community”.

This lack of interoperability represents also a limitation in the market penetration of EasyReach and reduce the richness and the attractiveness of the solution; in fact the success of a social network service is highly linked to the number of members belonging to the various interest groups.

We need to enlarge the EasyReach community and this can not be achieved with a proprietary, “exclkusive” system.

2.2 SIMPLIFY, SIMPLIFY, SIMPLIFY

Even if a large part of the older adults involved in the pilots of Rome and Milano judged the use of the EasyReach system quite simple and intuitive, there is still the need of further simplifications.

We have to avoid the risk of a system that is still too complex for people with no familiarity with the PC and ICT devices and at the same time it is “too obvious” and not needed to people able to use the PC.

A critical segment of the potential users is represented by the “introvert ones”: they already have a negative feeling with regard to the technology and are reluctant to interact with the other people. EasyReach system has to be so simple and at the same time so attractive to stimulate their interest of such and overcome these barriers.

2.3 IS GESTURE THE RIGHT INTERACTION MODALITY?

Someone expressed some doubts; often older adults have articulation and mobility problems with their hands (e.g. arthritis) and it will make difficult the execution of gestures enough precise to be correctly interpreted by the EasyReach system.

By considering the diversified spectrum of older users, we have to explore a “multimodal approach” (voice, gesture, touch, virtual keyboard...) in the interaction with the system by considering the diversified spectrum of older users.



EASYREACH is a Project of the
AAL Program (Call 2009-2)



Some users expressed the desire of having a virtual keyboard to allow the writing of short message or comments.

2.4 NEW APPLICATIONS

Among the new applications suggested by the users the more interesting are the following ones:

- To explore the use of EasyReach as a first step towards a computer education, i.e. a bridge to allow the older adults to get familiarity with the use of the PC and becoming citizens of the today's global, digital world rather than as a different and alternative tool for accessing Internet;
- EasyReach as a tool to extend e-government services also to the digitally challenged portion of the population;
- EasyReach as a channel for healthcare services (medical education, reminders, contact with healthcare centers, etc.);
- A tool to allow and foster the communication between already formed Groups (Associations, Senior Centers) and their members.

In the pilots executed in Milano it was interesting to notice that the two main dimensions of the EasyReach platform (communication and information) both meet a good agreement by users: communication and information are of equal importance so a mixed use is suggested. This means the creation of a social community that shares information while communicating and discusses on the news via the same portal hosting the community.

2.5 ATTENTION POINTS

- The correct operation of the system, the fluidity and reliability of its use are too linked to the availability of a good Internet connection; if this is not available the interaction with the system through the remote control unit becomes too slow and sometime imprecise.
- The operation of the system is linked to the use of the TV and to the wireless connection between the remote control and the set top box. Both these issues represent a limitation in the mobility of the user. A further development could be a "mobile EasyReach system" used with a tablet PC.
- The way of taking photos and making short videos with the remote control does not give a visual feedback to the user of the image he is recording.
- The password realized through the use of icons is simple but it seems too weak in terms of data protection.

APPENDIX 1 - INDICATORS OF ICT FOR AGEING WELL OUTCOMES

A1.1 INDICATORS FOR QUALITY OF LIFE IMPROVEMENT (SF-36v2 survey of the International Classification of Functioning, Disability and Health (ICF))

ICF systemizes the overall elements of citizen’s functional ability: Body Structure/Function, Activity and Participation. Additionally it considers the contextual (environmental) factors and personal factors as components that can enhance or limit functional ability (see figure below)

Short Form 36 (SF-36v2) is a self-report survey with 36 questions assessing the general health status including physical health and mental health. It has been recognized as one of the most widely used instruments for the measurement of health-related quality of life (HRQOL). It provides scores for each of the eight health domains (Physical Functioning, Role-Physical, Bodily Pain, General Health, Vitality, Social Functioning, Role-Emotional, Mental Health).

Some analysts objected that the use of the SF-36v2 survey for assessing the change of the quality of life due to the support of ICT assistive devices could be misleading since SF-36 measures all general health indicators while ICT intervention (e.g. telecare services) makes direct impact only on some of them.

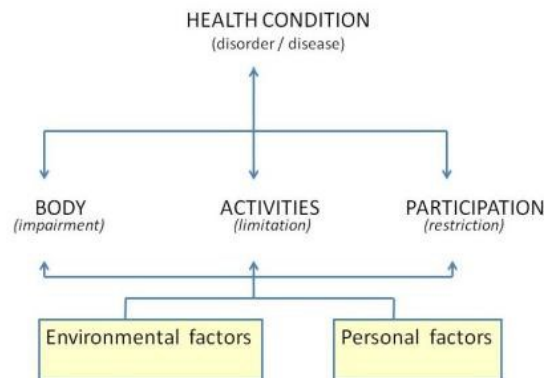


Fig. A1.1 – Quality of life linked to functional ability

A1.2 INDICATORS AND METHODOLOGIES FOR THE EVALUATION OF THE ECONOMIC IMPACT

The economic impact or the 'savings' that can be attributed to various ICT interventions are of considerable interest to both policy makers and industry. In health care and social care, benefits are frequently gained from cost avoidance, cost reduction, control of resource allocation, improvement in service quality rather than from revenue enhancement activities.

We report here below the methods proposed by three European projects:

1. **CIP DREAMING** project distinguishes between two categories of **clinical/economic indicators** (cash and time related) and differentiates primary / secondary indicators:

<i>Primary indicators</i>	<i>Secondary indicators</i>
<ul style="list-style-type: none"> ▪ Number of hospitalizations ▪ Number of permanent transfers to elderly homes 	<ul style="list-style-type: none"> ▪ Age to permanent transfer to elderly homes ▪ Total and average length of stay in hospital ▪ Number of consultations with GPs ▪ Number of consultations with specialists ▪ Number of home visits by nurses ▪ Number of home visits by social operators ▪ Number of ambulance transports ▪ Number of accesses to emergency rooms ▪ Number of falls ▪ Number of femur fractures ▪ HbA1c change over time (participants with diabetes only) ▪ Survival

2. **The Long Lasting Memories project** assesses - besides health – the following outcomes for determining project impact:

Technology and Usability	<ul style="list-style-type: none"> ▪ Number of technical support calls ▪ Comparison of log-files and system responses ▪ End-user satisfaction levels regarding usability of the technology (interviews / questionnaires) ▪ End-user satisfaction levels regarding form factor attractiveness (interviews / questionnaires)
Marketability	<ul style="list-style-type: none"> ▪ Technical staff (minimum skills level) able to effectively install the system without additional training. ▪ Reported technical problems addressed on a timely basis. ▪ End-users level of satisfaction with the use of and results from the solution ▪ Solution deployment delivered in a range of different elder care environments.

APPENDIX 2 – PREVIOUS WORKS IN CEA AND CBA

A2.1 THE TIDE CERTAIN PROJECT

The TIDE CERTAIN project (Technology Initiative for Disabled and Elderly – Cost-Effective Rehabilitation through Appropriate Indicators) – a project co-financed by the European Commission - was carried out during the period 1994-1996. Its objective was to provide a user-oriented method to evaluate costs and user benefits with regard to assistive technologies (AT). It included a retrospective study based on the analysis of a number of real life case studies with regard to cost, effectiveness and utility of individual assistive technology programs over a sample of people with disability who had adopted technical aids before the start of the CERTAIN project.

The sample was selected in such a way to include different pathologies (steady or progressive), impairments, ages, technology and social environment.

For **cost analysis** a purpose-made mathematical model was developed and computerized; for **effectiveness and utility** a number of scales were analyzed and tested.

Although conceptually designed for retrospective analyses, the CERTAIN tool may be also used as a prevision tool to assess different possible solutions.

CERTAIN includes 4 parts:

- A data collection structure,
- A processing tool,
- A reporting structure,
- A database.

The cost analysis takes into account the “social costs” i.e. the sum of all the resources mobilized by all actors taking part in the process. They can be *direct costs* (i.e. can be considered as a direct consequence of an assistive technology program such as the technology-related costs (equipment, fitting, maintenance) and the assisted-related costs (human help associated to the technology provided)) or *indirect costs* (such as lost working hours for undertaking a treatment).

The outcomes (benefits) analysis includes:

- Outcomes at the level of individual goals expectations (inner relation, daily activities and outer relations),
- Outcomes at the level of the family expectations,
- Outcomes at the level of the professionals expectations,
- Outcomes at the community level.

Assessment carried out in the last follow up are compared with goals and expectations set forth when the AT program was formulated.

The TIDE-CERTAIN project includes also methods for the effectiveness and utility analysis based on scales such as the FIM (Functional Independence Measure) scale, a modified version of the EuroQOL scale.

The CERTAIN research work had a follow up in other two projects related respectively to the analysis of the costs and the assessment of the efficiency and utility for Assistive Technology programs. This last topic was

addressed by the *EATS Project (Efficiency of Assistive Technologies and Services, 1997-99)* ; the costs analysis was studied by a research project co-financed by the Italian Ministry of Health and executed by the Italian Fondazione Pro Juventute Don Carlo Gnocchi.

In this project (“Cost outcomes analysis for AT”) a cost analysis instrument was designed (the SIVA Cost Analysis Instrument – SIVA/CAI⁸).

A2.2 A COST-BENEFIT ANALYSIS ON ASSISTIVE DEVICES (SWEDEN 2011)

A CBA was executed by the Swedish Institute of Assistive Technology (SIAT) on behalf of the Swedish Government⁹; the study (2009-2011) assessed the socio-economic impact of assistive devices for persons with mental disorders.

Mental disabilities can manifest themselves as difficulties in planning, organizing and being able to create own routines, difficulties in getting started and/or completing tasks, memory problems, sleep disorders, difficulties in obtaining an overall grasp of things, difficulties in functioning socially, knowing how to behave together with other people, difficulties in interpreting sensory impressions such as vision, smell, hearing and touch.

The cost-benefit analysis was based on information from existing studies and interviews with 20 experts (assistive technology consultants, officials within private and public sectors, occupational therapists and representatives of the AT industry) and 10 researchers.

We report here below a summary of the outcomes of a CBA

Table A2.1 – Cost Benefit Analysis related to Assistive Technology
(Sweden study of 2011)

BENEFITS		
User	Relatives	Overall society and Institutions
Support in the day-to-day tasks	Reduced need to provide support	Reduced need to provide support
Enhanced Quality-of-Life		
To retain or to find employment		Reduced loss of working force
		Additional jobs created in the Assistive Technology sectors
COSTS		
Cost of the assistive devices		
Time spent for training, needs assessment, prescription, trial and follow up		

⁸ SIVA (Servizio Informazioni e Valutazione Ausili), belongs to the IRCCS “S.Maria Nascente” of the Fondazione Pro Juventute Don Carlo Gnocchi

⁹ “Profitable assistive devices – Cost-benefit assessment of assistive devices for persons with psychiatric disabilities” , SIAT – Author: Ake Dahlberg; Editor: Annie Person; 2011

Quantitative assessment

Table A2.1 – Cost Benefit Analysis related to Assistive Technology (Sweden study of 2011) (cont.)

COSTS		
Average cost of the assistive device	2,100 Euro	
Time spent for training, needs assessment, prescription, trial and follow up	1,250 Euro	Average 30 hours
TOTAL COSTS	3,350 Euro	
BENEFITS (on a yearly level)		
Reduced need to provide support for the relatives	450 Euro	1 hour a week (52 hours a year)
Reduced need to provide support for the institutions	1,750 Euro	1 hour a week (52 hours a year)
Average increased productivity (see note 1)	1,500 Euro	
TOTAL BENEFITS	3,700 Euro	

It means that the costs are easily recovered in only 1 year.

NOTE 1: The study analyzed the additional benefit related to the occupational effects of assistive devices. They can support people with disabilities to maintain their job or – in the case they are not working – to get a job. By assuming that – according to the available data – 36% of the disabled people have already a job while 64% have no job, the study estimated that the contribution of assistive devices will allow 2% of disabled workers to keep their job and 7% of the unemployed people to get a job. As an average it will mean an increased productivity of 1,500 Euro per year (under the assumption of a yearly salary for a disabled employee of approx.. 20,000 Euro).