

# DAA DESIGN BRIEF

## ACCEPTANCE OF ASSISTIVE TECHNOLOGY

---

## Contents

<b>The project</b>	
“Design Led Innovations for Active Ageing”	3
<b>Abstract</b>	<b>5</b>
<b>Introduction:</b>	
<b>Examples of neglected acceptance</b>	<b>6</b>
The Electronic Health Card case	6
The “Stuttgart 21” case	7
<b>Acceptance – what was that again?</b>	<b>7</b>
<b>Acceptance in AAL – some figures</b>	<b>8</b>
<b>What factors influence acceptance?</b>	<b>11</b>
Functionality / added value	13
Ease of use and suitability for daily use	13
Safety and legal aspects	14
Cost and financing issues	14
Stigmatization and image issues	15
Ethical aspects	15
<b>Overview of Stakeholder Groups</b>	<b>16</b>
<b>Acceptance of Assistive Technology - Stakeholder Workshop</b>	<b>17</b>
Concept	17
Aims / Lessons learnt	17
Agenda	18
Methods	19
Participants	20
Results	21
<b>Literature on Acceptance / Robotics</b>	<b>29</b>
<b>Imprint</b>	<b>30</b>

## **THE PROJECT »DESIGN LED INNOVATIONS FOR ACTIVE AGEING«**

**The International Design Center Berlin represents the city of Berlin in the EU co-financed project “Design Led Innovations for Active Ageing (DAA)”. The project runs from January 2012 to June 2014 and includes partners from Antwerp, Barcelona, Berlin, Helsinki, Oslo, Sofia, Stockholm and Warsaw.**

Demographic change represents a common challenge for European cities. Predictions show that less and less care personnel will face a growing number of elderly people, while public resources decline.

The overall objective of the DAA project is to use design as a driver for innovation and help reinvent ways of addressing demographic change. By combining stakeholder experience with service designer expertise, DAA will contribute to social innovation and public sector transformation in the area of senior care. Stakeholders come from both the private and the public sector and include service providers, local authorities, companies that develop and sell technology, insurance companies, volunteers, policy-makers, and end users.

DAA adopts an approach that is both design-led and user-driven. In this context, design is not merely an element of style but a holistic method of enhancing the quality of processes and services. This human-driven design thinking takes the needs and requirements of users as its starting point and sees stakeholders as highly relevant to the respective processes.

DAA project partners have identified ‘scenarios’ specific to their local context. These eight scenarios tackle topics as diverse as housing, budgeting, social inclusion and technology. Local designers in each city conduct co-design workshops, introducing empathic methods and visualization tools to support strategic decisions and policy-making.

Berlin focuses on assistive technologies and their acceptance. Initial research findings on end-user acceptance are specified below. Little attention, however, has been paid to acceptance by other stakeholders, although the diversity of their requirements could lead to additional acceptance criteria or a shift in emphasis. The IDZ intends to advance this research within the framework of the DAA project and extend the set of criteria. The goal is to make recommendations that will be essential to the future success of innovations in the field of AAL (Ambient Assisted Living).

## ABSTRACT

Due to demographic change and the shortage of care personnel, technology that encourages older people to live independent lives is gaining significance. Several research projects are in the process of developing robots and other assistive technologies, e.g., in the field of Ambient Assisted Living (AAL). This field refers to intelligent assistance systems for a better, healthier and safer life in a preferred living environment, and covers concepts, products and services that interlink and enhance new technologies and the social environment. Up to now, research has led to the introduction of numerous AAL systems, such as telemedicine tools, automated emergency calls and supports for the activities of everyday life. Most research projects, however, are still uncertain about how best to transfer these developments to the market with sustainable business models [3, 7].

Focusing on end-user requirements is clearly a key component of acceptance[1, 2, 4]. The stakeholder perspective, on the other hand, has been neglected, although embracing stakeholder requirements is vital when it comes to sustainable business models and, consequently, to the implementation of AAL in the real world.

## INTRODUCTION: EXAMPLES OF NEGLECTED ACCEPTANCE

The following examples indicate how disregard for acceptance issues can be the downfall of large-scale projects.

### The Electronic Health Card case

The Electronic Health Card was intended to replace the old German health insurance card in 2006. The new card was designed to store personal health data and thus optimize specific medical processes, while reducing health service costs. Lack of data safety caused concern among citizens about the misuse of their medical history details, e.g., health insurances could increase premiums for risk groups. Negative press on the issue led to low public acceptance of the card and subsequently to major changes. Positive arguments such as time and cost efficiency or speed in emergencies gained little currency among the wider public. Introduction of the card has been postponed several times, some functions have not yet been implemented, and project costs have exploded from €1 billion to between €3 and 14 billion (not solely due to acceptance issues).



### The “Stuttgart 21” case

“Stuttgart 21” is a large railway and urban development project in Stuttgart, Germany. Its core is a renewed Stuttgart Central Station with high-speed links to other cities involving new tracks and tunnels. Plans were officially announced in April 1994. Project costs rose from €4.5 to 6.5 billion. This sparked off heated debate on a broad range of issues, such as the cost-benefit ratio, geological and environmental concerns, and performance aspects – primarily as a result of excluding the different stakeholder groups in the decision-making process.

There are countless other cases, some due to neglect of user and stakeholder requirements, some the outcome of poor communication.

## ACCEPTANCE – WHAT WAS THAT AGAIN?

Acceptance is that component of innovation that generates a positive response from the persons concerned [14].

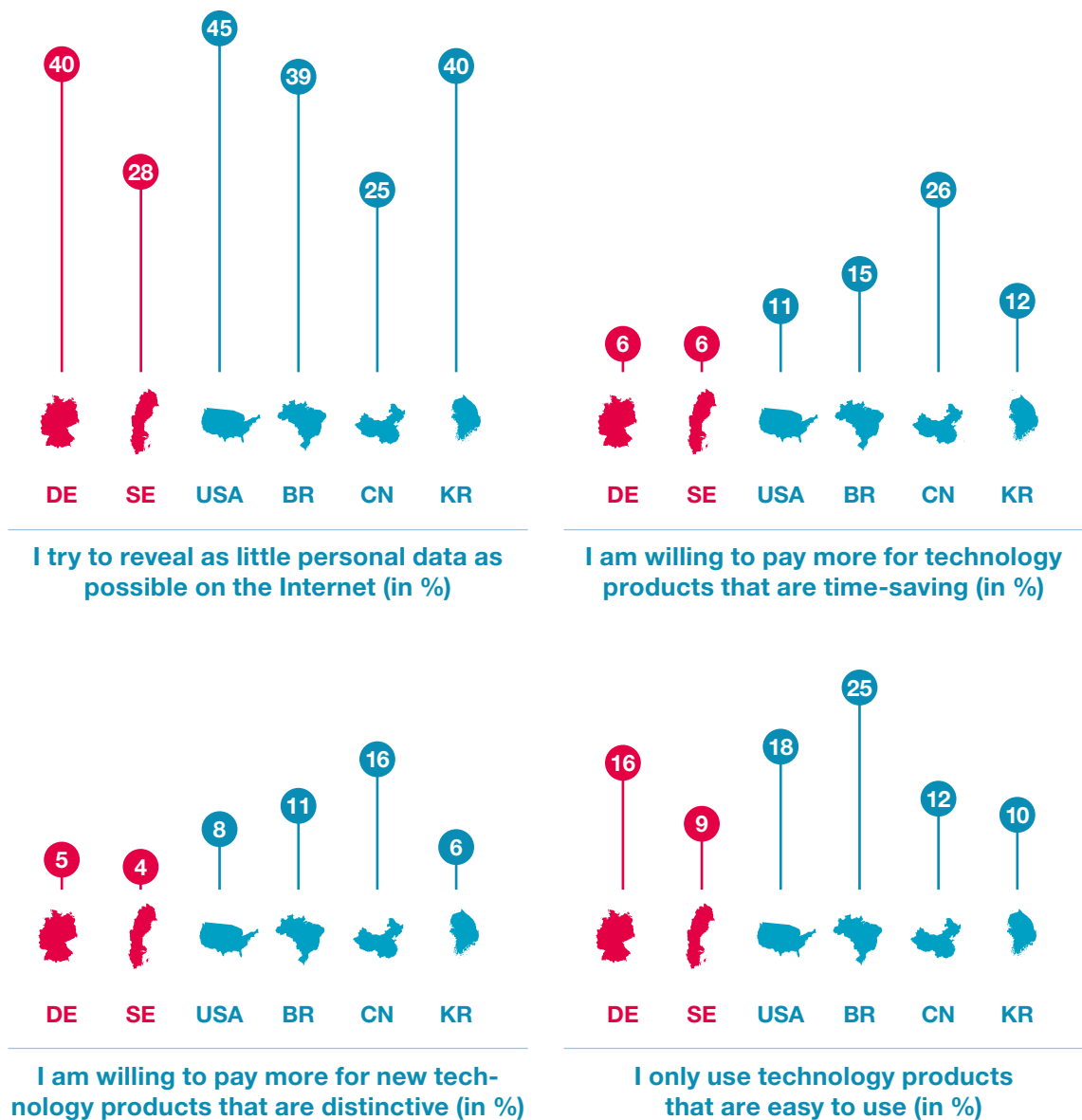
It is also a precondition for the diffusion of new technologies, products and services, and hence motivation for their purchase and their use. Consequently, acceptance is crucial to market success. Even small acceptance issues gain momentum with media attention.



## ACCEPTANCE IN AAL – SOME FIGURES

Acceptance figures for the field of AAL shown in the following charts indicate considerable potential, on the one hand, but much apprehension and a significant lack of knowledge, on the other.

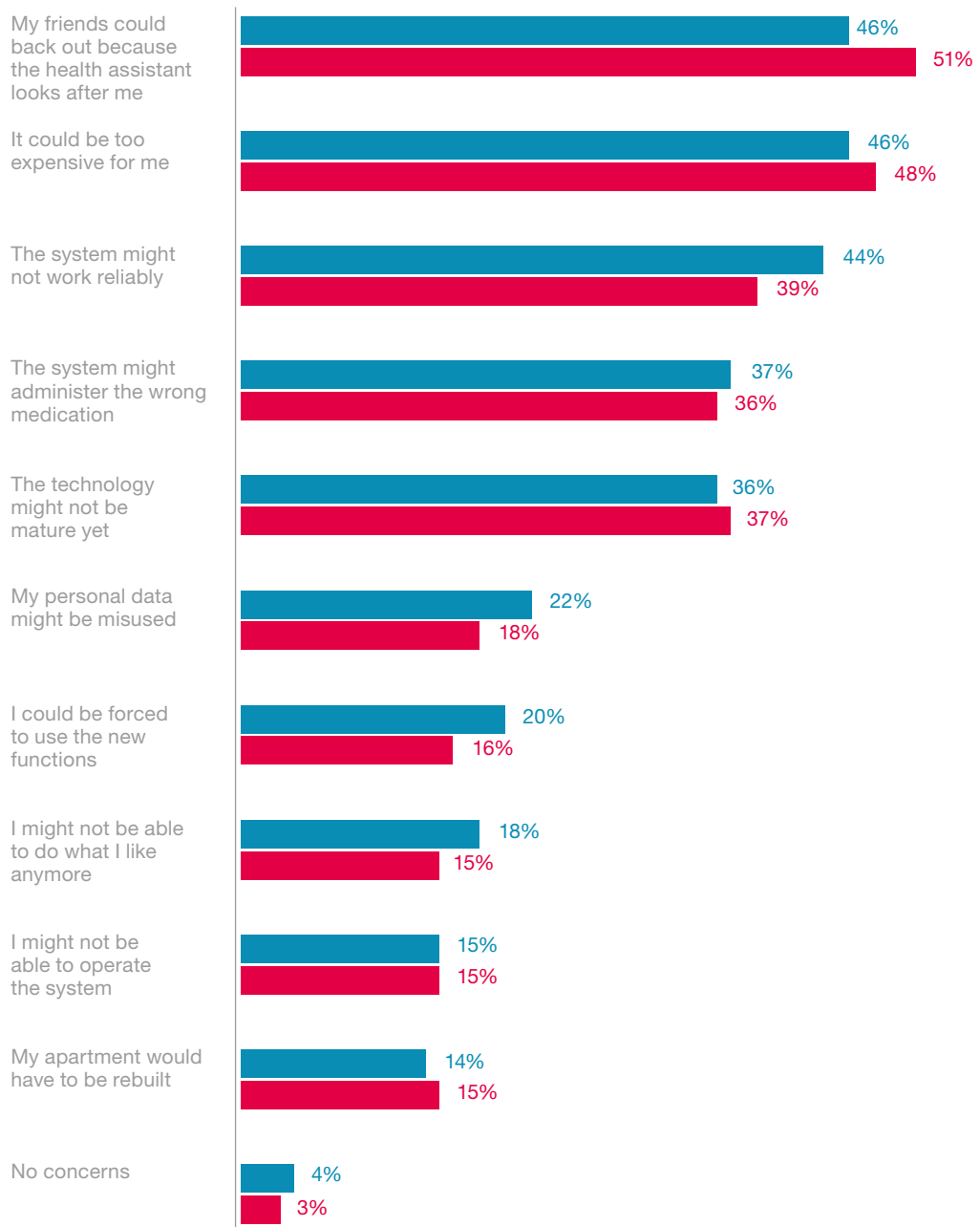
A study entitled “Pictures of the Future in a Digital World” carried out in 2011 analyses visions of the future from the user point of view in an international comparison. It reveals thought-provoking figures on acceptance by end users, some of which are shown below [12].



Explanation: DE=Germany; SE=Sweden; USA=United States of America; BR=Brazil; CN=China; KR=South Korea

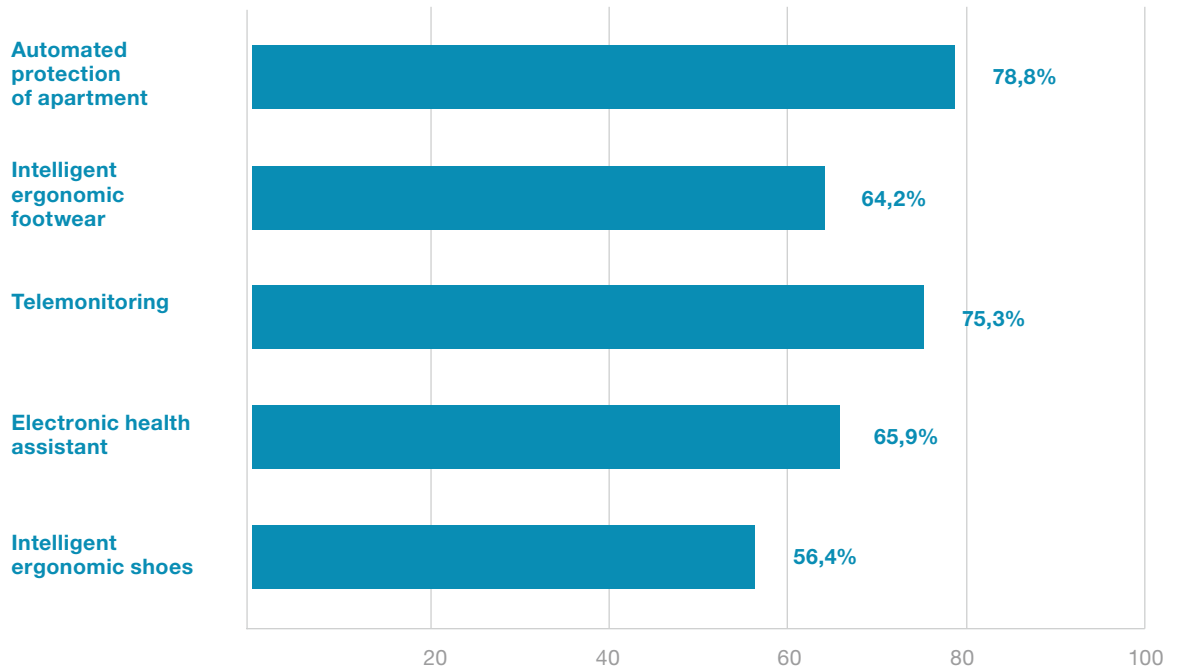


## German end-user concerns about the use of AAL technologies



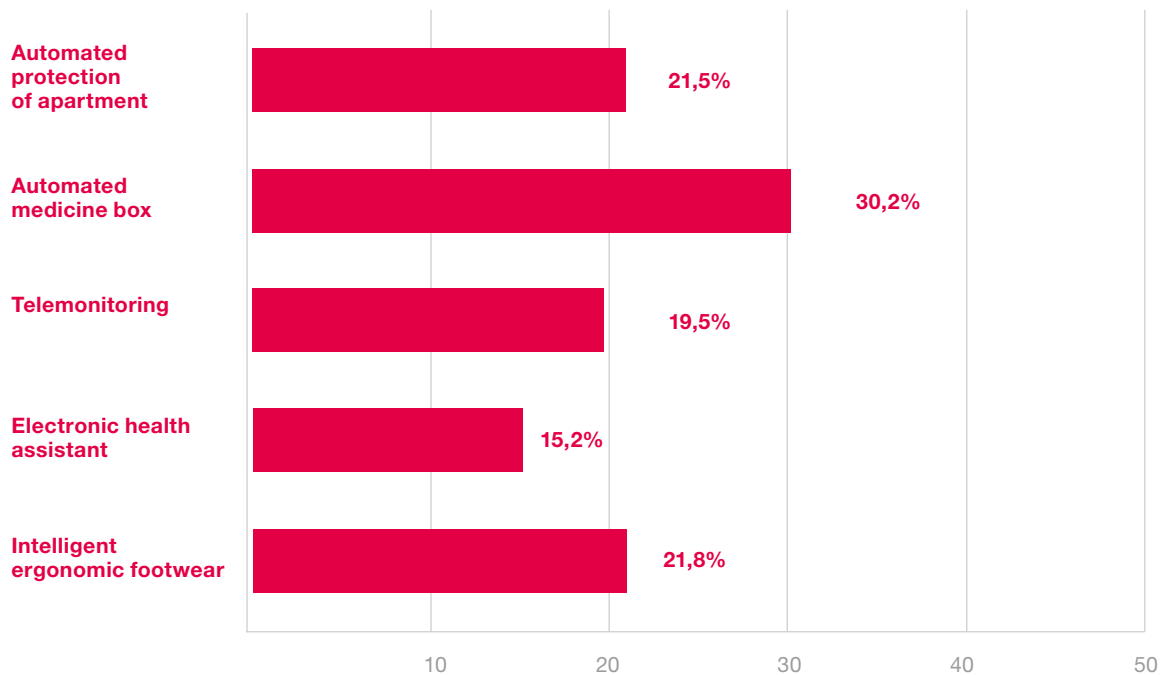
The same study also researched the concerns users might have when using AAL technologies. Most important were objections regarding the loss of social relationships, costs, reliability and data safety.

### Willingness to use AAL systems



Another study [2] focused on the specific acceptance of five AAL scenarios. It showed generally positive attitudes - with best results for technologies that improve health aspects and the safety of the living environment.

### The use of this AAL technology “shows that I am not able to take care of myself anymore”

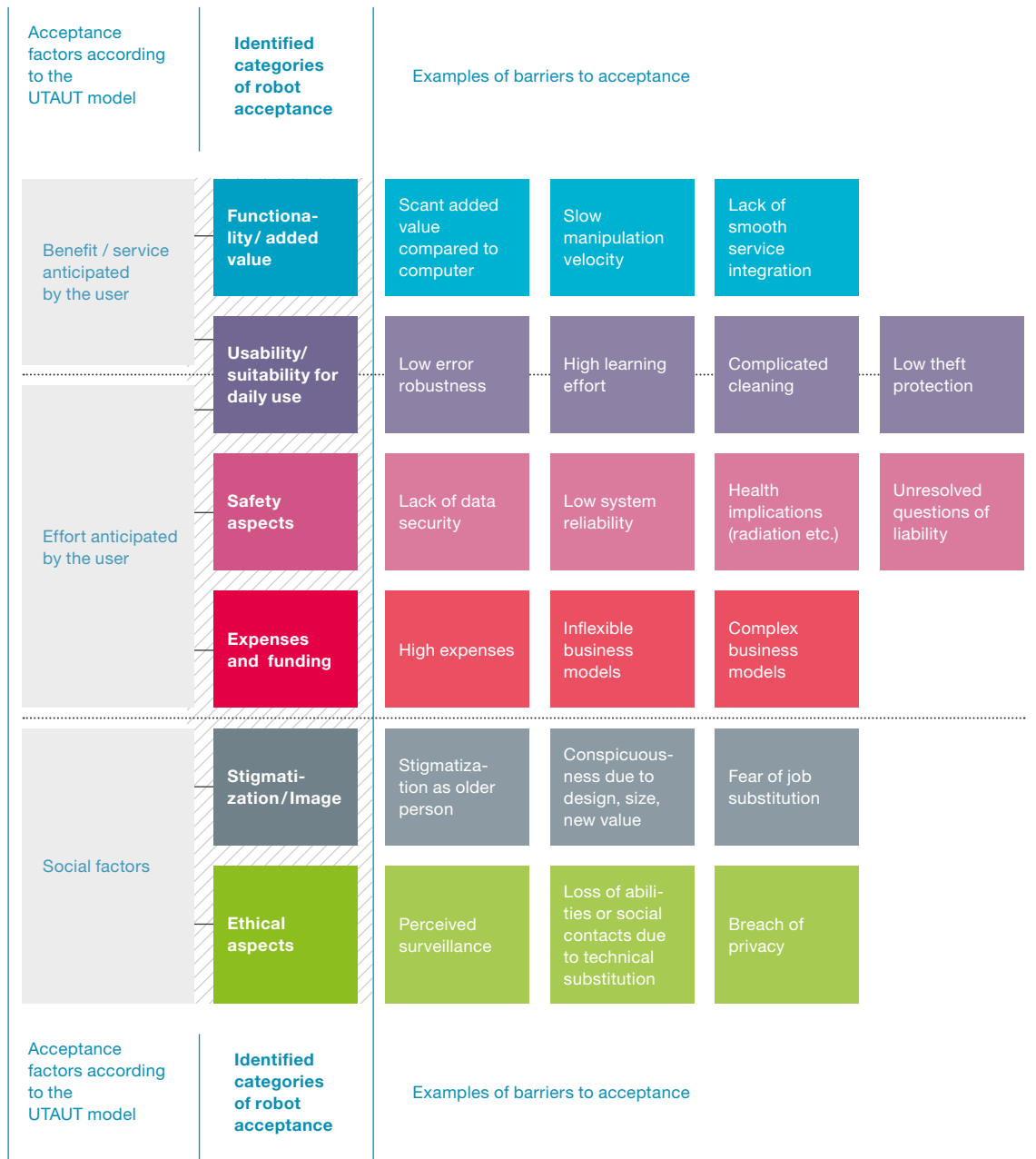


## WHAT FACTORS INFLUENCE ACCEPTANCE?

Thinking about acceptance brings specific aspects to mind: cost, ethics, product design, product image ...

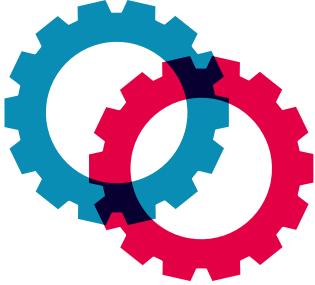
Several scientific models describe acceptance systematically. One well-known acceptance model is the Unified Theory of Acceptance and Use of Technology (UTAUT), drawn up by Venkatesh and others in 2003. The aim of UTAUT is to explain user intentions when they avail of an information system and to understand their subsequent usage behaviour. The theory holds that four key constructs (performance expectancy or benefits, effort expectancy, social influence and facilitating conditions) are direct determinants of usage intention and behaviour. Gender, age, experience, and voluntariness of use are posited to moderate the impact of these constructs on usage intention and behaviour. The theory was developed from a review and consolidation of the constructs of eight models that emerged in earlier research [5].

In the EU Robot Era project, this model translated fluently to the field of robotics (see chart below). The chart describes the factors relevant to acceptance, which can be seen as benefits, efforts and/or social influences (facilitating conditions have been omitted to reduce complexity).



Since research on acceptance is still ongoing, the model is likely to be enhanced in the coming years, e.g., with new acceptance factors or the relevance of specific factors to individual stakeholder groups.

In the following, the acceptance categories are described briefly in an effort to understand the complexity of the acceptance construct, using the example of robotics for the elderly.



### Functionality / Added Value

Mechanical functions play a major role when it comes to acceptance. Robots must be able to supply specific functions that cannot be substituted by a computer or smartphone (regular communication functions).

Also, robot functions tend to be combined with services, making it vital that they be fully integrated into service networks (e.g., for emergency calls or medication orders).

In terms of functionality, different stakeholders will clearly have different requirements. Among the functions most frequently mentioned are those referring to physical supports (e.g., transportation of objects). Another key functional category is support for tedious and time-consuming tasks such as documentation (e.g., in care facilities).



### Ease of use and suitability for daily use

Ease of use is a twofold component of acceptance in UTAUT. On the one hand, it is part of the expected effort associated with using a robot, e.g., if interaction is complicated and needs extensive training in advance. On the other hand, positive user experience due to excellent interaction design can lead to user pleasure and thus be regarded as an expected benefit (think of the first iPod users and the click wheel).

A typical user topic is transportation design: if an outdoor robot designed to accompany a person in the city or out in the country does not measure up with a tram, bus or train (too big or unable to cross entrance barriers), its suitability for daily use is limited. The same applies when a robotic system is hard to use or lacks theft protection.

## Safety and legal aspects

As society becomes more and more digitalized, the issue of data security has become more and more controversial, not merely in relation to robotics. With daily monitoring and the collection of personal data, such as vital parameters, robots could advance to become a data pool par excellence.

Those familiar with robotics have often voiced concrete concerns. Several studies show that the importance of data security is closely linked to the psychological pressure produced by health risks. Hence a high-risk patient in danger of a heart attack is more likely to embrace the notion of safe storage of confidential information than a healthy person.

In addition, lack of an institutional robotic framework has led to increased protest in terms of liability and safety aspects. The “Robots and Robotic Devices – Safety Requirements for Personal Care Robots” standard, for example, will define the maximum power of robotic components, such as manipulators. At the same time, safety check structures must be developed and clear regulations laid down to define liability in the case of accidents.

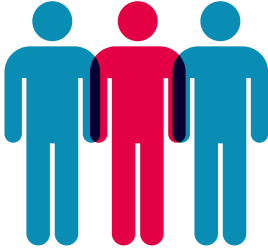


## Costs and financing issues

Another “anticipated effort” from the user and stakeholder point of view is cost and financing opportunities. The willingness of private end users to pay would not be sufficient to cover costs. It can be assumed that insurances will only support the use of robots when long-term studies have clearly confirmed positive cost effects. Moreover, there is a major possibility of involving family members in business models, since they are frequently more willing to pay for the safety and health of their parents than the parents are themselves. Running costs constitute a further aspect, e.g., energy and services, a key consideration for institutions using several robots simultaneously.

Finally, there is a demand for business models with reduced costs for single users, e.g., renting or shared use of assistive systems.





### Stigmatization and image issues

Social and ethical factors likewise influence robot acceptance. Some people feel stigmatized when they use a machine that reflects their need for support in everyday life. Accordingly, designers must make sure that robots deliver practical support, on the one hand, but are perceived as a modern “accessory”, on the other.

Robot size and shape is a sensitive issue. Some people favour a humanoid design, others strongly reject this notion. Some want small, unobtrusive assistants, while others only trust heavier machines when it comes to transportation and mobility support tasks.

Last but not least, caregivers in particular are wary of robots as their potential replacements – an aspect that can impact heavily on the generally positive attitude to robotics [9].

### Ethical aspects

A common objection to robots is the risk of losing contact with real people. On the other hand, robots can be programmed to encourage users to socialize in the real world, e.g., by reminding users to call their families. There is, however, a strong likelihood that elderly users, who want robots to be “nice” and “polite”, will see them as social partners, i.e., as substitutes for real people. When robots ask users if they have slept well and users reply “fine thanks and you?” a conversation begins and “social” contact is established.

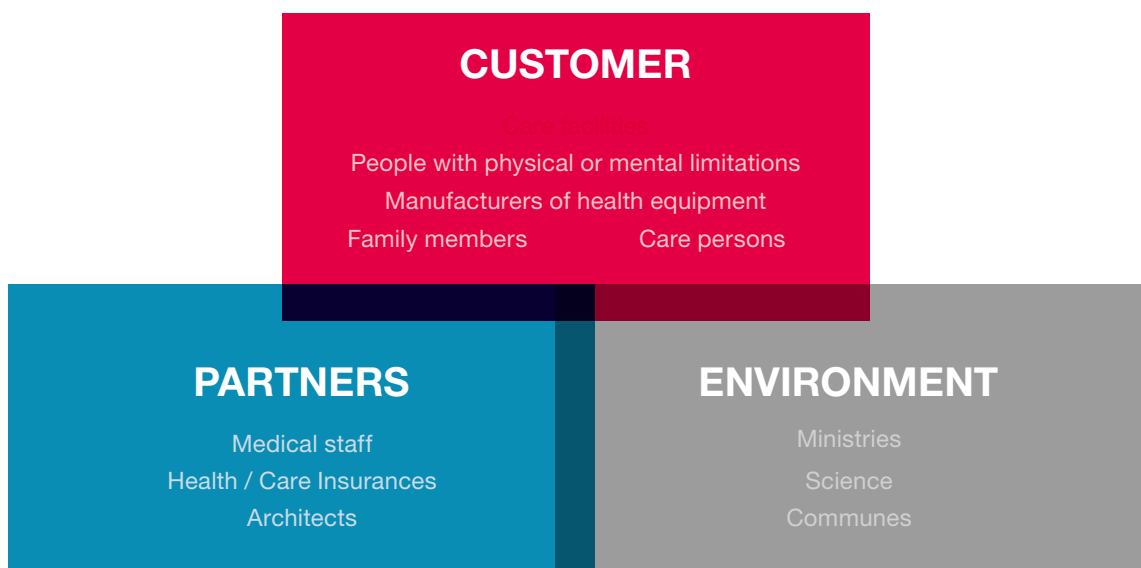
Yet another aspect is the possible acceleration of physical and mental degradation, should robots take over more tasks than required in reality. Their capacity to monitor multiple factors may also suggest a sense of surveillance, a feature considered ethically unfavourable.

At the same time, robots have the potential to solve ethical issues, e.g., when they take over the more strenuous tasks performed by caregivers and thus reduce the frequency of occupational illness or when they enable older people to live independent lives that are both longer and happier [3, 10].



## OVERVIEW OF STAKEHOLDER GROUPS

Stakeholders are internal and external groups influenced directly or indirectly by actions taken and by the effects of the products/services developed. They can be categorized and identified in a number of ways. The diagram below shows a straightforward approach that works well in research projects, where multiple organizations collaborate to develop an innovative system that will be used by a variety of customers in diverse environments [8].



Stakeholders are institutions or groups with specific interests, e.g., older or handicapped end users, their families, formal and informal care persons, companies that develop and sell robotics technology, insurances that could benefit from lower health costs, municipalities interested in enhancing the welfare of their citizens. All of these stakeholders have different requirements, interests and acceptance barriers. The relevance of the individual acceptance factors described above varies from stakeholder to stakeholder and has not yet been researched, although it is crucial to ensuring sustainable development and functioning business models. The planned workshop will address this issue!



# ACCEPTANCE OF ASSISTIVE TECHNOLOGY - STAKEHOLDER WORKSHOP

## Concept

---

Although several studies have been carried out on user requirements and integrated into AAL developments, few of these developments have so far reached the market. One reason is that not all stakeholders see the benefits of pushing AAL onto the market, be it the health or the housing sector.

Against this background, the workshop identified and prioritized key acceptance criteria, facilitators and barriers from the different stakeholder perspectives. Workshop participants were organized in groups representing four different stakeholders in the field of AAL/Robotics (Municipalities, Cost Bearers, Care Institutions, Product and Service Providers). With the help of creative techniques, these groups specified acceptance criteria and barriers in AAL/robotics from their perspective. Participants then presented their individual work to the audience, after which the results from each group were discussed. The workshop leaders summarized the results in line with the UTAUT model, as described below.



## Aims / lessons learnt

---

### The workshop set out to:

- ... identify acceptance criteria, facilitators and barriers from different stakeholder points of view
- ... provide new insights into creative methods and techniques
- ... improve the ability to empathize with the various stakeholder groups and to adopt the perspective of other disciplines
- ... increase knowledge of the benefits and potentials of AAL and robotics
- ... enhance sensibility to the requirements of elderly people as an important target group

## Agenda

---

The workshop took place on 25 October 2013 in the orangelab in Berlin with the following agenda:

---

<b>9:00 – 10:00</b>	<b>Welcome remarks and introductory speeches</b> <ol style="list-style-type: none"><li><b>Ingeborg Stude</b> <i>Senate Department for Urban Development: Welcome speech</i></li><li><b>Benjamin Seibel</b> <i>Technical University Darmstadt: For we don't know what they do - The ethics of human machine interfaces</i></li><li><b>Dr.-Ing. Sebastian Glende</b> <i>YOUSE GmbH: Understanding robot acceptance - risks and solutions</i></li></ol>
<b>10:00 – 10:30</b>	<b>Warm up &amp; target definition for each stakeholder group</b>
<b>10:30 – 12:30</b>	<b>Teamwork Part I (Walt Disney Method)</b>
<b>12:30 – 13:30</b>	<b>Lunch break</b>
<b>13:30 – 15:00</b>	<b>Teamwork Part II (UTAUT Model)</b>
<b>15:00 – 15:50</b>	<b>Final presentation of results</b>
<b>15:50 – 16:00</b>	<b>Summary &amp; lessons learnt</b>

## Methods

---

Three methods were chosen to identify acceptance issues in a structured and comprehensible manner. Taken from the fields of creativity and design thinking, they had to fulfil specific criteria: to produce new results, boost creativity, include all of the participants, help to document the results and – last but not least – entertain and motivate in order to secure the commitment of all attendees. The selected methods are described below.

### Brainwriting

Brainwriting is a creativity technique used to generate ideas from end users or stakeholders. The workshop supervisor presents and explains the question, after which each participant writes down suggestions or solution strategies related to the question on a sheet of paper. This is passed on to a neighbouring participant, who refines or amends the ideas. The next step is a discussion of the written solutions, approaches or ideas with the members of the working group. Unlike brainstorming, this technique allows for inclusion of the ideas of all participants present and not merely those of the most self-confident. It was used here to identify and collect the general aims of stakeholder groups [8].

---

### Walt Disney Method

The Walt Disney Method is a creativity technique used to generate new, realistic ideas. The selected ideas can be visualized, e.g., with storyboards. Participants are divided into three groups: “Dreamers” (generate ideas regardless of their practical implementation), “Realists” (think of the steps required to put these ideas into practice), and “Critics” (assess potential advantages and disadvantages of these ideas). The method was used to identify and discuss acceptance criteria and barriers in the field of AAL [8].

---

### UTAUT model

The Unified Theory of Acceptance and Use of Technology (UTAUT) is a well-known acceptance model (see also page 11). It explains user intentions and helps to understand their usage behaviour. The model was adapted to the field of AAL/robotics and describes the factors relevant to acceptance, i.e., benefits, efforts and/or social influence. It was used in the workshop to allocate identified acceptance criteria and barriers to predefined acceptance categories, or to define additional categories where necessary [5].

---

### Sticky dots voting

Sticky dots voting is a technique whereby each participant is given a defined number of sticky dots. These can be stuck to the most positive or most negative ideas or solutions on a flipchart. Workshop participants used three green sticky dots to indicate positive factors and three yellow dots to mark negative issues. With this technique, the relevance of the acceptance facilitators and barriers was rated [8].

## Participants

---

36 participants from 9 European countries (Spain, Finland, Belgium, Sweden, Germany, Norway, Poland, Bulgaria, Switzerland) attended the workshop and brought in different perspectives: people who work for focused stakeholders (Municipalities, City Councils, Insurances, SME, Project Execution Organizations, Social Services, Care Institutions) and those involved in research (Design, Innovation Management, Technology, Ageing) on AAL.

Hence the workshop brought a wide variety of AAL sector stakeholders together, all of them closely linked to the focus groups. Since all four groups consisted of people from different European countries with different work backgrounds, the results are a first insight into stakeholder acceptance issues – but need to be confirmed by further representative studies.



## Results

---

### Stakeholder groups and their general aims

Participants were allocated to the four stakeholder groups according to their professional backgrounds. In a first step each group established their general aims using the brainwriting technique.

Figure 1 is a short outline of the aims of each stakeholder group.

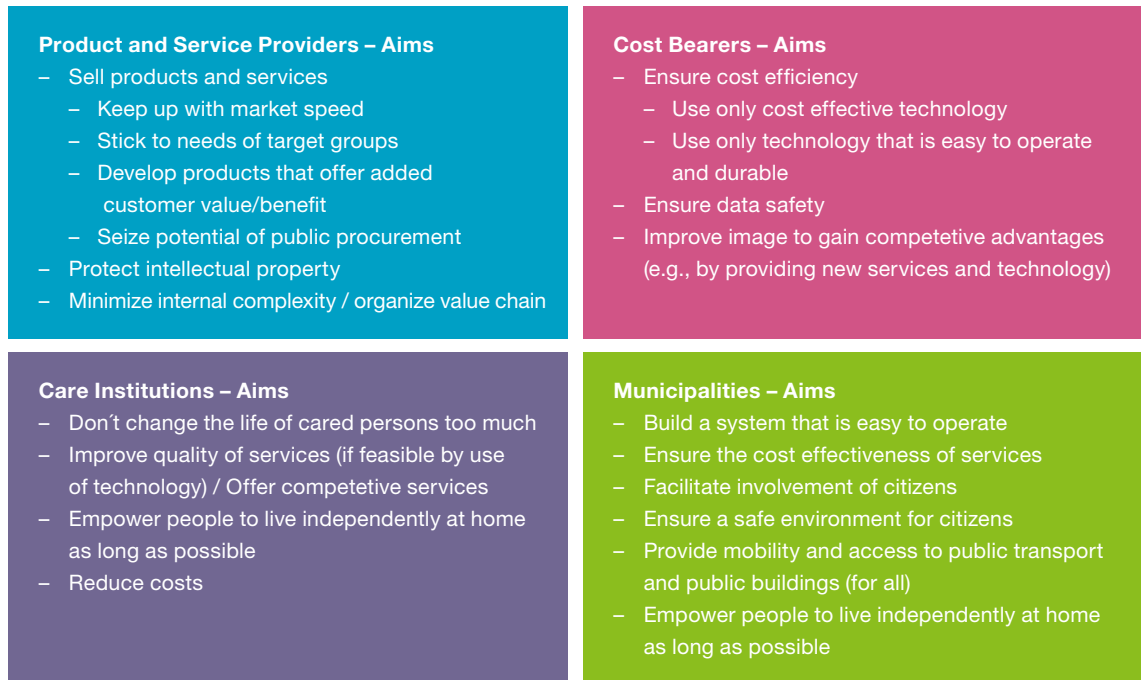


Figure 1: Identified main aims of involved stakeholder groups

### Acceptance criteria and their relevance

Using the Walt Disney Method and based on the general aims of their stakeholder group, group members identified key acceptance issues in the field of AAL. The issues were then allocated to existing acceptance categories – where this was not possible, new categories were introduced. Finally, the sticky dots voting method was used to rate the relevance of these acceptance issues. The category “safety aspects” was broadened to include “safety and legal aspects”, since both tend to arise in the same context. The “Municipalities” and “Care Institutions” groups created the category “Attitude” to refer to the mental attitude of employees and organizations in terms of readiness for change. This category might also be suitable for other stakeholders and can influence the acceptance of AAL technologies considerably. The “Care Institutions” group also defined “sustainability” as an acceptance category, taking into account the growing interest in environment friendly systems – and again, this category could be relevant for other stakeholder groups.

The “Product and Service Providers” group drew up a new category entitled “market aspects”, a key criterion when it comes to investing in AAL, yes or no.

The characteristics of each stakeholder group are outlined briefly in the following.

## Product and Service Providers

This group differs radically from the other three. It thinks in terms of “embracing opportunities“ in the AAL market rather than of “acceptance“. The focus is clearly on market aspects, a new category. Expenses are seen as a strong barrier, especially since a reliable public procurement process has not yet been established. Uncertainty arises with the subject of vague legal conditions, unreliable financing and an arguable acceptance of target groups. Figure 2 gives an overview of the acceptance factors and their evaluation during the workshop.

Benefit / service anticipated by the user	<b>Market aspects (new criterion)</b>	+++++ Stable market growth	+++ Opportunity to adapt existing products to AAL market and integrate with existing devices	---- Speed of market too high / big companies might overtake small enterprises	-- Highly diverse market
	<b>Functionality/ added value</b>	+++++ AAL offers benefits to vast target groups	-- AAL products not yet marketable		
	<b>Usability/ suitability for daily use</b>				
Effort anticipated by the user	<b>Safety and legal aspects</b>	+++ AAL products can improve safety	---- Unclear regulations / legal setting		
	<b>Expenses and funding</b>	----- Unclear financing / public procurement	--- Low willingness by private and public sector to pay		
Social factors	<b>Stigmatization as older person</b>				
	<b>Ethical aspects</b>				

Figure 2: Identified acceptance criteria and barriers (Product and Service Providers)

### Cost Bearers / Insurances

Due to the differences in local cost-bearing systems, defining acceptance criteria in this group was challenging (Germany, for example, relies on insurances, whereas other countries pay health expenses via the municipal tax system).

Cost bearers focus on cost reduction, but also on the health improvement and/or safety of the insured. The group sees strong benefits in AAL (for example, 24h care by means of technology). Data safety, privacy and ethical aspects are major stumbling blocks, since they could have a negative impact on the cost bearers' image (cf. Figure 3).

Benefit / service anticipated by the user	Functionality/ added value	+++++ 24h care is possible	+++ Improved services lead to image enhancement	++ AAL is a step towards the future	-- Slow-moving organizations might not keep up with the development speed of AAL
	Usability/ suitability for daily use	++ AAL systems might be easy to use	+ AAL systems might be fun to use		
Effort anticipated by the user	Safety and legal aspects	----- Unclear responsibility in the case of accidents	----- Data safety not guaranteed	----- A false sense of security is given	
	Expenses and funding	+++++ AAL reduces care and medication costs	--- Different municipal areas pay for / benefit from AAL		
Social factors	Stigmatization as older person				
	Ethical aspects	----- Equal access to AAL technology might not be ensured for all users	----- Technology might replace human relationships	-- Technology cannot be tested on people	

Figure 3: Identified acceptance criteria and barriers (Cost Bearers / Insurances)

## Care Institutions

The Care Institutions group provided a diverse view of AAL acceptance during the workshop. This stakeholder group sees huge benefits for patients and staff, on the one hand, but is cautious when it comes to safety and ethical issues. It suggested two new categories in the area of social factors: “Attitude” and “Sustainability”. Details on the various acceptance factors can be derived from Figure 4.

Benefit / service anticipated by the user	<b>Functionality/ added value</b>	++++ AAL must ensure independency of the elderly	+++ AAL must keep staff healthy	+++ AAL must be a time saver for personal interaction	+ Technology should reduce personnel bottlenecks
	<b>Usability/ suitability for daily use</b>	+++ AAL might provide intuitive technology	+ Clearly defined task sharing between humans and technology	+ Technology might be fun to use	
	<b>Safety and legal aspects</b>	----- Unreliable technology	--- Unclear responsibility in the case of accidents		
	<b>Expenses and funding</b>	+ Rental and leasing models for AAL	- No plans for provision of AAL to the less well-off	- High costs	
Effort anticipated by the user	<b>Stigmatization as older person</b>	-- Technology that stigmatizes will not be rejected by the elderly			
	<b>Ethical aspects</b>	-- Relationship between personnel and patients could be belittled	- Technology might not allow for individual treatment		
	<b>Attitude (new criterion)</b>	----- Staff is not open for or interested in using new technology			
	<b>Sustainability (new criterion)</b>	++ Environment friendly AAL products	--- AAL products could waste energy		
Social factors					

Figure 4: Identified acceptance criteria and barriers (Care Institutions)



## Municipalities

Municipalities see AAL as a means of gaining closer contact to and becoming more involved with their citizens. While cost issues are seen as a positive factor (AAL could help to reduce costs), there are serious concerns about data safety. This group, in comparison to the other three, is far more concerned about whether their own organization will have to struggle to handle AAL technologies and thus fail to benefit from them. Similar to care institutions, municipalities also introduced the “Attitude” category, which refers to internal barriers such as low motivation to use AAL. By supporting AAL pilot projects, they could produce a change in the attitude of citizens and staff (see also Figure 5).

Benefit / service anticipated by the user	Functionality/ added value	+++++ AAL encourages citizen involvement	--- AAL technology might be outdated before operation starts			
	Usability/ suitability for daily use	+++++ Technology must be easy to use and maintain	----- Unclear responsibility for operation of technology			
	Effort anticipated by the user	Safety and legal aspects	----- Data safety not guaranteed			
		Expenses and funding	+++++ AAL could replace other processes / technology and thus save costs	++- AAL could replace staff		
Social factors	Stigmatization as older person					
	Ethical aspects					
	Attitude (new criterion)	+++++ Pilot runs in real environments could stimulate interest and acceptance				

Figure 5: Identified acceptance criteria and barriers (Municipalities)

### General criteria relevant to all groups

All four groups highlighted that the complexity of AAL business models makes it difficult to provide benefits for all the stakeholder groups involved simultaneously. Another general issue raised by the groups was the poor state of AAL development, making it almost impossible to rely on standardized or stable environments in terms of legislation and finance. Costs are a key issue for the stakeholders. This is not adequately reflected by research agendas and funding scheme aims. Product and service providers in particular are afraid that investments in AAL might not pay off. The other groups also need more reassurance about the cost-saving potential of these technologies. In contrast to the Product and Service Providers group, the other three groups tend to see AAL as an opportunity to save money – which in turn could be a motivation to sell the products. Hence cost analysis, acceptable product and service costs, and stable revenue streams are important topics to work on in the coming years if AAL is to be pushed onto the market. On the contrary, Care Institutions, Municipalities and Cost Bearers are particularly concerned about safety aspects. They are apprehensive about unreliable technology, a false sense of security and the risk of low data safety. Product and Service Providers see trouble primarily on the legal front, but think they can solve “technical” safety problems (cf. Figure 6).

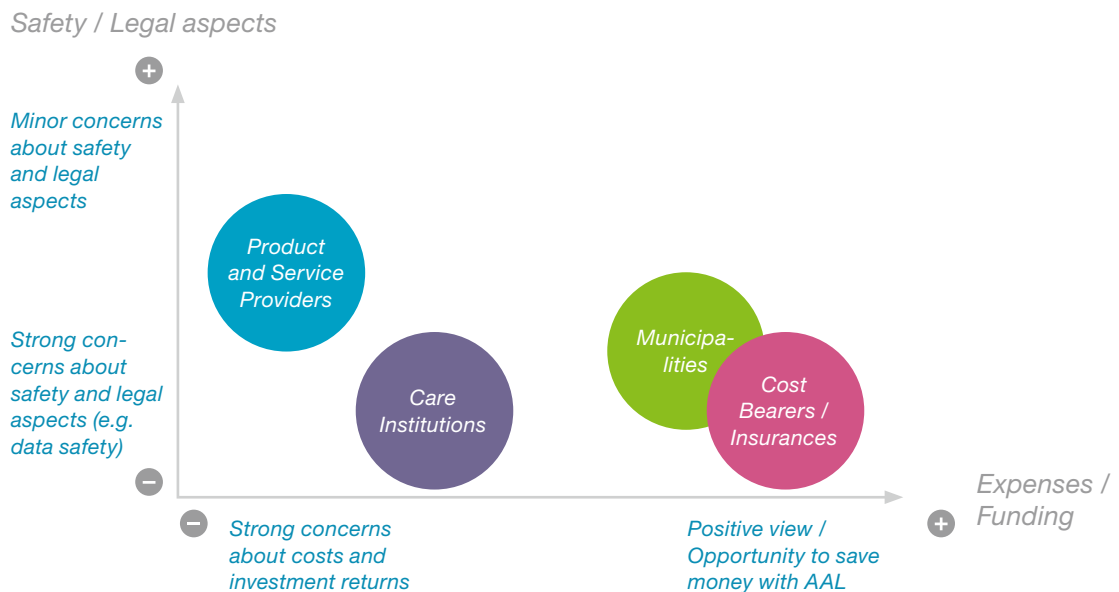


Figure 6: Comparison of stakeholder groups regarding the relevance of Expenses / Funding Issues and Safety / Legal Aspects

Almost all participants see pilot projects as a chance to allow citizens and employees to become familiar with new technologies.

As a result of the uncertainties involved, stakeholders have been reluctant to step into the market. Even smaller, more flexible companies that were essentially willing are afraid of being overrun by bigger companies as soon as the market gains momentum.

## Recommendations

The workshop results show the complexity and the obvious differences and similarities of the acceptance issues in the various stakeholder groups. Although a variety of opinions, aims and experiences made the integration of several stakeholders a challenging task, a number of results were achieved. The results of the workshop cannot be considered representative, but point to several topics that could either foster or hinder the success of AAL and thus potentially influence the direction of AAL research and the focus of its funding. The methods applied proved successful in motivating a large number of participants in creative processes. At the same time, these results must be improved and the stakeholders concerned reassured in further studies.

Initial recommendations can be drawn from the workshop content and, if put into practice, serve to advance the success of AAL. They are shown in the table below (Table 1). Concrete ideas generated in workshop discussions are marked in the table with bullet points.

Recommendation	Affected acceptance categories
<p><b>Research and develop procedures for public procurement / financing in AAL</b>  <i>Example:</i></p> <ul style="list-style-type: none"> <li>– Establish a public trust to finance pilot projects</li> </ul>	<p>Expenses and funding</p>
<p><b>Involve the relevant stakeholders in early phases of product and service development to determine potential benefits and business models for the product or service under review</b></p>	<p>Expenses and funding            Market aspects            Functionality/ added value</p>
<p><b>Push forward research on legal frameworks around AAL</b>  <i>Examples:</i></p> <ul style="list-style-type: none"> <li>– Improve possibilities for public bodies to buy technical solutions and save on overall costs (although this could increase costs in other areas of the institution)</li> <li>– Define or enhance rules to deal with intellectual property</li> </ul>	<p>Safety and legal aspects</p>
<p><b>Establish reliable technical and procedural standards in the area of AAL to facilitate development and ensure user acceptance.</b>  <i>Examples:</i></p> <ul style="list-style-type: none"> <li>– Develop and communicate standard interfaces for technical equipment and data transfer</li> <li>– Implement norms at EU level</li> <li>– Develop EU certification of AAL products</li> </ul>	<p>Safety and legal aspects            Usability / suitability for daily use</p>

<p><b>Conduct more pilot projects and allow people to try out and evaluate AAL technologies. This would raise awareness and stimulate people’s interest, improve the attitude of employees to AAL (e.g., in care institutions or municipalities), and confirm cost-saving potential.</b></p>	<p><b>Market aspects</b></p> <p>Attitude</p> <p>Usability / suitability for daily use</p> <p>Expenses and funding</p> <p>Ethical aspects</p> <p>Functionality/ added value</p>
<p><i>Examples:</i></p> <ul style="list-style-type: none"> <li>– Establish or enhance showrooms to exhibit available products and inform visitors where to buy AAL solutions and how to install them (should be organized by independent institutions to guarantee objectivity)</li> <li>– Develop and show products that take over secondary care tasks only in order to counter concerns that AAL might impair individual treatment and social relationships with patients</li> <li>– Adapt existing and accepted products with additional AAL functionalities</li> </ul>	
<p><b>Push forward integration of AAL products into existing frameworks and points of sale</b></p>	<p><b>Market aspects</b></p>
<p><i>Examples:</i></p> <ul style="list-style-type: none"> <li>– Organize maintenance services / educate existing technical service in AAL</li> <li>– Identify and illustrate ways to access existing and effective sales channels (e.g., via consumer electronics retailers)</li> </ul>	
<p><b>Develop and publish guidelines on data safety in the handling of personal data in AAL</b></p>	<p>Safety and legal aspects</p> <p>Ethical aspects</p>
<p><b>Focus development and funding on reliable low cost products and services that can enter the market rapidly. More complex products can follow once basic acceptance has been ensured.</b></p>	<p>Functionality/ added value</p> <p>Market aspects</p> <p>Expenses and funding</p>
<p><i>Examples:</i></p> <ul style="list-style-type: none"> <li>– Provide ways of renting or leasing AAL technology</li> <li>– Facilitate product lending so that companies and institutions can test and get used to AAL technology</li> <li>– Provide easy-to-use customer support</li> <li>– Provide portable technology that can be used everywhere – not merely in one home</li> <li>– Focus on “low-hanging fruit”, show cost-saving potential in easy-to-understand processes</li> <li>– Describe clearly quick and easy ways to install, use and benefit from AAL</li> </ul>	
<p><b>Harness potential of expanding “green” market</b></p>	<p><b>Sustainability</b></p>
<p><i>Examples:</i></p> <ul style="list-style-type: none"> <li>– Provide solutions that draw energy from the environment with micro harvesting</li> <li>– AAL product providers should recycle the substituted devices</li> </ul>	
<p><b>Inform and educate stakeholders about the benefits of AAL and its operational areas</b></p>	<p><b>Attitude</b></p>
<p><i>Examples:</i></p> <ul style="list-style-type: none"> <li>– Educate AAL experts and consultants in advising stakeholders or mediating between them</li> <li>– Develop AAL qualification programmes (also on-the-job qualification)</li> <li>– Develop a platform to bring companies and individuals together to discuss AAL</li> <li>– Research and publish clear cost-benefit analysis for the use of AAL products and services (focused on the different user or stakeholder groups)</li> <li>– Define clearly the tasks to be taken over by technology (to reduce fear of job loss)</li> </ul>	

Table 1: Recommendations to policy and other AAL stakeholders drawn from workshop results

## LITERATURE

- [1] F. D. Davis: User acceptance of information technology. Internat. Journal of Man-Machine-Studies (38), pp 475–487, 1993.
- [2] D. Oesterreich, E. Schulze et al.: Akzeptanz von AAL-Technologien zur Unterstützung der Gesundheit und Sicherheit. BIS, Berlin, 2008.
- [3] E. Broadbent, R. Stafford, B. MacDonald: Acceptance of Healthcare Robots for the Older Population: Review and Future Directions. Journal of Social Robotics; 1; pp. 319–330, 2009.
- [4] H. Mollenkopf et al.: Akzeptanz und Anforderungen älterer Menschen und ihrer Angehörigen; in: S. Meyer, H. Mollenkopf (Hrsg.): AAL in der alternden Gesellschaft – Anforderungen, Akzeptanz und Perspektiven; VDE Verlag, Berlin, 2010.
- [5] V. Venkatesh, M. Morris, F. Davis, M. Davis: User acceptance of information technology –toward a unified view. MIS Quarterly, 27(3), pp 425–478, 2003.
- [6] H. Legewie, B. Schervier-Legewie: Im Gespräch: Anselm Strauss. Journal für Psychologie, 3(1), pp 64–75, 1995.
- [7] S. Glende: Senior User Integration – Konzepte, Werkzeuge und Fallbeispiele – Ein Leitfaden für die Einbindung älterer Nutzer in die Produkt- und Serviceentwicklung; SVH, Saarbrücken, 2010.
- [8] YOUSE GmbH, Technische Universität Berlin: Innovation Toolbox – Methoden- und Personakarten; Berlin, 2011.
- [9] E. Goffman: Stigma – Über Techniken der Bewältigung beschädigter Identität; Frankfurt am Main, Suhrkamp Taschenbuch Verlag, 1967.
- [10] M. Foucault: Überwachen und Strafen; Frankfurt am Main, Suhrkamp Taschenbuch Verlag, 1976.
- [11] H. Braun-Thürmann: Innovation; Bielefeld, Transcript, 2005.
- [12] Münchner Kreis e.V.: Zukunftsbilder der digitalen Welt – Nutzerperspektiven im internationalen Vergleich; Berlin, 2011.
- [13] K. Zink et al.: Train-the-Trainer-Konzepte; Berlin, Springer, 1997.
- [14] G. Endruweit, G. Trommsdorf: Wörterbuch der Soziologie; München, dtv, 1989.

### Image references:

- <http://derhonigmannsagt.files.wordpress.com/2011/10/gesundheitskartemerke.jpg>
- <http://www.infiniteunknown.net/wp-content/uploads/2010/09/stuttgart-21-sitzblockade.jpg>

## IMPRINT

The DAA project is co-financed by the European Regional Development Fund and made possible by the Interregional Cooperation Programme (INTERREG IVC), which is financed by the European Union Regional Development Fund and helps regions of Europe to work together to share experience and good practice in the areas of innovation, the knowledge economy, the environment and risk prevention.



### Publisher

**IDZ | International Design Center Berlin**  
[www.idz.de](http://www.idz.de)

**IDZ** International  
Design Center Berlin

### In cooperation with

**YOUSE GmbH**  
Dr.-Ing. Sebastian Glende  
[www.youse.de](http://www.youse.de)

YOUSE®  
real users, real innovation