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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 added 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 are 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.

Focusing on end-user requirements is clearly a key component of acceptance. 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 “Drosselkom” case
Telekom, Germany’s largest telecommunications provider, announced plans to throttle broadband Internet services for flat-rate customers, once their data transfer volume exceeded between 75 and 400GB a month (depending on the contract).

In spring/summer 2013, this triggered a so-called “shit storm”, with thousands of Telekom customers showering their provider with harsh criticism. All they knew was: their bandwidth was to be reduced, a course of action later associated with curtailing Internet freedom. Most people, however, were unaware that only three per cent of approx. ten million Telekom users would be affected.

In addition, the measure contained a positive spin-off for ordinary customers, who would now no longer be subsidizing excessive downloading by heavy users.

German Telekom (frequently referred to as “Drosselkom”, meaning “Throttlecom”) suffered a blow to its image, while the cost of redesigning the concept and restoring press relations was more than substantial.
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 (Endruweit / Trommsdorf 1989). 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].

<table>
<thead>
<tr>
<th>Country</th>
<th>I try to reveal as little personal data as possible on the Internet (in %)</th>
<th>I am willing to pay more for technology products that are time-saving (in %)</th>
<th>I am willing to pay more for new technology products that are distinctive (in %)</th>
<th>I only use technology products that are easy to use (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DE</td>
<td>40</td>
<td>25</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td>SE</td>
<td>45</td>
<td>16</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>USA</td>
<td>39</td>
<td>11</td>
<td>25</td>
<td>9</td>
</tr>
<tr>
<td>BR</td>
<td>28</td>
<td>6</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>CN</td>
<td>25</td>
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<td>12</td>
</tr>
<tr>
<td>KR</td>
<td>40</td>
<td>26</td>
<td>25</td>
<td>10</td>
</tr>
</tbody>
</table>

Explanation: DE=Germany; SE=Sweden; USA=United States of America; BR=Brazil; CN=China; KR=South Korea
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.
Another study [2] focused on the specific acceptance regarding five AAL scenarios. In this, generally positive attitudes could be shown – with best results for technologies, that improve the safety of the living environment and health aspects.

The use of this AAL technology “shows, that I am not able to care 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.

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.

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.
OVERVIEW OF STAKEHOLDER GROUPS

Stakeholders are internal and external groups influenced directly or indirectly by actions taken and 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.

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!
**PLANNED WORKSHOP**

**Concept**

Workshop participants will be organized in groups representing the different stakeholders in the field of AAL/Robotics (e.g. city council, insurances, family members, care facilities and staff, service providers). With the help of creative techniques, they will specify acceptance criteria and acceptance barriers in AAL/robotics from their perspective. Participants will then present their individual work to the audience, after which the results of each group will be discussed. Workshop leaders will draw a summary of the results in line with the UTAUT-Model. A checklist based on the results of each working group will be distributed to participants after the workshop.

**Aims / Learnings**

… gain new insights into creative methods and techniques  
… improve the ability to empathize with the various stakeholder groups and to adopt the perspectives of other disciplines  
… increase the knowledge of the benefits and potentials of AAL and robotics  
… enhance sensibility to the requirements of elderly people as an important target group
## Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 – 9:10</td>
<td>Welcoming remarks</td>
</tr>
<tr>
<td>9:10 – 10:00</td>
<td>Introductory speeches</td>
</tr>
<tr>
<td></td>
<td>1. Ingeborg Stude</td>
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<tr>
<td></td>
<td><em>Senate Department for Urban Development: Welcome speech</em></td>
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<td>2. Benjamin Seibel</td>
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<td><em>Technical University Darmstadt: Technical artefacts - social functions</em></td>
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<td>3. Dr.-Ing. Sebastian Glende</td>
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<td><em>YOUSE GmbH: Understanding robot acceptance - risks and solutions</em></td>
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<td>10:00 – 10:15</td>
<td>Warm Up</td>
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<td>10:15 – 10:30</td>
<td>Target definition for each stakeholder group</td>
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<td>10:30 – 10:40</td>
<td>Introduction Method Part I (Walt Disney)</td>
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<td>10:40 – 12:00</td>
<td>Performance Method Part I</td>
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<tr>
<td>12:00 – 12:30</td>
<td>Collection of initial results</td>
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<td>12:30 – 13:30</td>
<td>Lunch break</td>
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<tr>
<td>13:45 – 15:00</td>
<td>Performance Method Part II</td>
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<tr>
<td>15:00 – 15:50</td>
<td>Final presentation of results</td>
</tr>
<tr>
<td>15:50 – 16:00</td>
<td>Summary &amp; lessons learned</td>
</tr>
</tbody>
</table>
LITERATURE


Image references:
- http://i.imgur.com/hcNeoQQ.png
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.