

# Assisting age related capabilities by ambient technology to prevent functional decline

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**Abstract.** The elderly is characterized by age related capabilities and handicaps. Whereas age related capabilities like plasticity and adaptability on changing living conditions can lead to subjective well-being and support the recovery of limiting conditions like disease and disability, age related handicaps can enforce these conditions. Multimorbidity can lead to acute and chronic functional decline, especially when limiting conditions are enforced by age related handicaps. In a “circulus vitiosus” disease and disability threaten the independence of the elderly that leads to immobility, social isolation, depression and other health conditions with amplification and generation of new diseases. Ambient Technology has the potential to interrupt this “circulus vitiosus” by limiting age related handicaps, assist age related capabilities, prevent acute or chronic diseases and as a consequence can improve the quality of life of elderly and their care giving relatives. In this overview we demonstrate a brief summary of past experience with Information and Communication Technology (ICT) as part of Ambient Technology (AT) in the “TeleReha” project and ongoing approaches in the “Vitanet” project and the “FOG-1” project followed by a future considerations conducting ICT-Project in elderly.

**Keywords:** Ambient Technology (AT), Ambient Assisted Living (AAL), Information and Communication Technology (ICT), elderly, multimorbidity, quality of life

## 1 ICT approaches for elderly

Ambient technologies are technical solutions that work together in an adaptive and interactive environment assisting people in their daily life with individual needs. Addressing an important item of ambient technology, we conducted an observational study “TeleReha - Development, Implementation and Evaluation of Technical Support in Geriatric Rehabilitation and Care” funded by the Deutsche Telekom GmbH that fills the communication gap of elderly people [1] [2]. Videophones, internet resources, and multimedia computers were used for linking social workers, psychologists, physicians and specialized services with elderly people. Instant and personalized access to health care services followed by an interventional approach can avoid functional decline and severe illness. However, it is not clear whether

Information and Communication Technologies (ICT) as a part of Ambient Technologies (AT) are effective in supporting elderly people. Some studies already showed its applicability and feasibility, but there are still no larger trials showing that maintenance or enhancement of autonomy can be achieved effectively by using AT. The “TeleReha” project, conducted at the Department of Geriatrics Research (Geriatrics Center Charite University Medicine Berlin) observes mobility-impaired patients (N=13, mean age 72 yrs), care giving relatives (N=8), and geriatric professionals using networking technology with videophones or PC-based videoconferencing systems.



Figure 1: Network Link between project collaborators at Geriatrics Center Charite University Medicine, Berlin and elderly study member at home in the “TeleReha” project.

Results showed that participants regard telecommunication devices as a valuable resource for their informational and communicational needs. Use of telecommunication systems was inversely related to physical mobility. Having access to professional service and counseling was rated highly important but also the opportunity to establish reliable contacts with non-professionals (relatives, other participants). Despite experienced technical problems, use of telecommunication systems was evaluated more positively in the post-test as compared to the pre-test. In summary, the “TeleReha” project suggests that ICT can be used efficiently by geriatric patients and by relatives and professionals caring for them [3]. The Vitanet ([www.vitanet.de](http://www.vitanet.de)) portal is another project, launched in 2001 from Research Group on Geriatrics at Charite Berlin. Vitanet is a Web portal that provides information about health related topics like dementia, heart failure, nutrition and diabetes mellitus for elderly people. Vitanet provides also practice guidelines for elderly and their relatives for home and outpatient care topics.



Fig 2: Vitamet Web portal; here practice guidelines for patients and relatives with hemiparesis after stroke.

In a guided chat room health care professionals (e.g. physicians and pharmacologists) answer questions of the visitors. One example for elderly adapted web service is the magnifier for hyperopic users. Vitamet reports 1,19 million visits in the third quarter of 2006 with primary use of women aged 35-49y [4]. Only 2% of visitors were 65y and older. This reflects actual obstacles of using the internet for elderly people, like lacking hardware (personal computer, internet connection) or fear of break down in front of handling a new electronic device. Another ongoing project is the FOG-1 study “Usability of a sensor based home rehabilitation system in elderly” which is funded by Philips AG [5]. Background of the initiation is that Stroke patients have not reached their full potential when they are discharged from acute hospital. Although guided home rehabilitation is proven to lead to further improvement in motor learning and enabling the patient for activities of daily living there is no standard treatment for home rehabilitation of stroke patients. The feasibility study with 15 participants aims to show the usability of the sensor based home stroke rehabilitation system in elderly with functional deficits of the upper limb. Secondly we want to show the safety and motor learning of this system.



Figure 3: Usability of a sensor based home rehabilitation system in elderly; study member using the touchscreen while exercise training wearing wireless motion sensors.

First impressions mediate a very positive feedback from elderly. Perspectively we want to conduct a randomized controlled trial to show the effectiveness of the home stroke rehabilitation system assisting motor learning after stroke in home environment.

## 2 Future Considerations for the development of ICT for elderly

However, evidence for a medically and economically effective use of ICT in elderly is still scarce. Evidence based evaluation concepts in clinical trials observing ICT in home ore other environments are insufficient. If we have to take three steps to achieve an ICT project to maturity phase, most ICT projects fail to demonstrate the first step: the usability. This depends on the fact that most of these projects were industrial and were developed without knowledge and participation of elderly people. ICT-projects which conquer the first step, fail the second: demonstration of doubtless effectiveness. Because of the very heterogeneous evaluation concepts used in hundreds of trials worldwide, we recommend standardized outcome measures considering quality of life, functional assessments based on daily activities, caregiver stress, environmental factors including social situation and in any case economical benefit. There are a view approaches that climb the first and second step with satisfiable success, but fail the last because of unconsidered economical benefit. Our recommendations for the development of ICT as a part of AT and AAL environments have to consider the three basic steps: usability, evaluation of effectiveness and economical benefit

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