Participation of citizens as potential endusers in the innovation process for assistive technologies

Walter Hlauschek, Wolfgang L. Zagler, Paul Panek

(Dipl.-Ing. Walter HLAUSCHEK, CEIT RALTEC, Institute for Rehabilitation and Assisted Living Technologies, non profit limited company, Am Concorde Park 2, A 2320 Schwechat, Austria, w.hlauschek@ceit.at, http://www.ceit.at)
(Prof. Dipl.-Ing. Dr. Wolfgang L. ZAGLER, fortec - Research Group on Rehabilitation Technology, Institute „integrated study", Vienna University of Technology, zw@fortec.tuwien.ac.at, http://www.is.tuwien.ac.at)
(Dipl.-Ing. Paul PANEK, CEIT RALTEC, Institute for Rehabilitation and Assisted Living Technologies, non profit limited company, Am Concorde Park 2, A 2320 Schwechat, Austria, p.panek@ceit.at, http://www.ceit.at)

1 ABSTRACT

This paper describes the efforts of the city of Schwechat in creating a local information society by supporting the Schwechat Living Lab (LL) for Ambient Assisted Living (AAL) technologies and services. Local authorities, social service providers, elderly persons, carers, research entities and companies have started to cooperate closely as full partners in this Living Lab in order to invent, discuss, explore, implement, and evaluate innovative technologies to support the independent living of senior citizens. This approach allows focusing on the actual needs of the future users by involving them right from the beginning. The paper gives an overview on the approach of the AAL Living Lab, it describes some projects currently being carried out and discusses the experiences gathered since 2006. The findings in the Living Lab are promising, especially the feedback from the user community is very positive

2 INTRODUCTION

2.1 The Programm eSchwechat

Schwechat is a town nearby Vienna, Austria's capital. It is a traditional industry site, housing a large brewery, Austria's largest oil raffinery, chemical and metal industries, motorways, a railway-hub and Vienna International Airport. Based in this situation the government of Schwechat decided to force efforts to bring innovative institutions and companies into the city in order to develop the city into an information society of the 21st century.

Schwechat's government started a 5 year program called "eSchwechat.at", based on the EU-initiative i2010. Following targets have been defined: (a) intensifying the development of the Schwechat information society, (b) following the e-Inclusion program by integrating disadvantaged people, especially elderly people and people with special needs, and easing the usage and the access to state of the art ICT-technologies, (c) increasing education of Schwechat's citizens towards ICT-technologies by establishing non academic and academic education for under-graduates and post-graduates (d), creation of new ICT-oriented jobs and (e) moving in of new inhabitants.

To reach these targets, different actions were started: (a) founding of Central European Institute of Technology (CEIT) as an extra faculty R&D institute, running two departments, of which RALTEC carries out research in the area of e-Healthcare and e-Homecare, rehabilitation and Assisted Living Technologies and ALANOVA develops modern planning technologies for towns and regions linked with Information Society Technologies while emphasizing sustainability and protection of the environment, (b) starting Academia Nova as an University of Cooperative Education, (c) supporting young ICT-enterprises and (d) establishing WLAN environement in public space.

2.2 The AAL Living Lab Schwechat

2.2.1 Characteristcs of an AAL Living Lab

When developing Assistive Technology (AT) products and services the intensive and early involvement of users in the innovation and design process is of highest importance to ensure that the intended future product will be able to meet the actual needs of the future users in their daily life.

The importance of user involvement in AT projects was recognised and described by numerous authors and definitively helps to make such projects a success. Nevertheless there is a need to further improving the concept and the daily practise of user involvement and user participation. A report of the Joint Research Centre states with regard to user needs in ICT research for independent living [Comyn et al., 2006, on p. 17): „In short, the central role that user needs and priorities ought to play all along the innovation chain from

research and development to implementation is well established, but actual implementation lags behind. User needs are ill-understood, existing mechanisms for their articulation and integration into the technology development process are insufficiently mapped, and new strategies for more user involvement have barely been elaborated."

Living Lab (LL) stands for an emerging research methodology which includes "sensing, validating and refining complex solutions in multiple and evolving real life contexts". One very important aspect to be considered is that "the real challenge may lie in involving users in a sociological sense, that is to say, by taking into account the micro-context of their everyday lives" [N.N. ISTAG report, 2004] cited in [Niitamo, 2006], [Eriksson 2006].

Ambient Assisted Living (AAL) is a new technology based approach to support elderly citizens. "AAL aims to prolongate the time people can live in a decent way in their own home by increasing their autonomy and self-confidence, the discharge of monotonously every day activities, to monitor and care for the elderly or ill person, to enhance the security and to save resources." [Steg et al., 2006]. AAL is partly based on existing work in AT but extends the area with a larger vision [Edelmayer et al. 2006].

2.2.2 Methodology of Schwechat's Living Lab

A main part of the eSchwechat initiative covers the setting up of a living lab, which considers the whole town of Schwechat as a "living laboratory", where new devices and services can be tried out under real life conditions in an ethical sound way. The Living Lab approach forms an important focus point for Schwechat for its path to become an internationally recognised ICT location [Paugger, 2007b].

One part of the living lab is focusing on the area of Assistive Technology (AT) and Ambient Assisted Living (AAL) [Panek et al., 2007], [Panek & Zagler, 2008]. Working cooperation between main partners have been established: (a) senior citizens (b) local centre for senior citizens (c) research institute Ceit Raltec (d) city administration (e) companies (d) mobile social service providers and (f) international contacts.

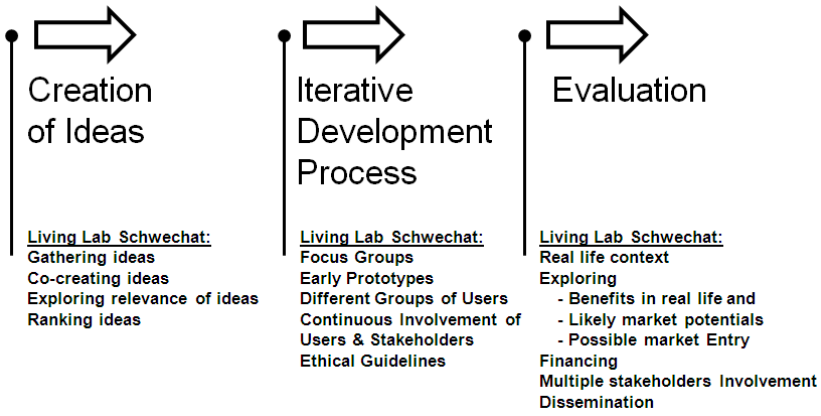

Fig. 1: Development Process of Assistive Technology (AT) devices and systems and some useful contributions specifically provided by the AAL Living Lab in city of Schwechat

In Fig. 1 some main phases in the design process are shown: Creation of ideas, development of prototypes and testing. The AAL Living Lab approach contributes in all mentioned areas. In particular the real life setting allows establishing a user community which in the mid and long term also contributes to the innovation process by gathering and exploring new ideas the researchers not even have thought about initially. The design process itself most often is not linear but to be considered as consisting of several steps with integral need for re-evaluation of the target which is to be reached. The target might better be changed due to finding of the previous steps as for example the users might deliver solid arguments for a shifting of the target. It also might happen that barriers hinder the design process to proceed as originally planned and thus reorientation to overcome the barriers is needed. For these situations the involvement of the users in the day to day context helps to re-focus the process iteratively in several small steps.

Some of the main principles applied in the AAL Living Lab are: to meet the users and carers in their daily living situation, to have regular monthly meetings with the user representatives, to be aware of the many stakeholders (not only primary and secondary users but also financing institutions, e.g. the city

administration). Also to consider the importance of involving the users as early as possible, preferable already during brainstorming phase when new project ideas are generated and discussed. Another main aspect is the importance of ethics [Rauhala & Topo, 2003] in the AAL Living Lab. Informed consent procedure and information kits [Rauhala & Wagner, 2005] were taken over from previous AT projects (in this case a FP5 project which has developed an intelligent toilet system by intensive participation of elderly and disabled persons [Egger de Campo et al., 2006], [Rauhala & Wagner, 2005], [Rauhala, 2007]) the material from this project was modified accordingly.

3 CURRENT PROJECTS INVOLVING SENIOR CITIZENS

Five RTD projects currently carried out in the AAL Living Lab in Schwechat are decribed in this paper:

• **"e-Home":** user-centred development of a minimal intrusive wireless monitoring and guidance system to increase the safety and autonomy of independently living senior citizens. The system is based on small distributed modules which are connected via the ZigBee wireless protocol and are equipped with sensors for light, temperature, reed relay and acceleration [Diermaier et al., 2008];

• **"e-Shoe":** the development of an instrumented shoe / shoe sole which is equipped with different types of sensors in order to be able to recognise and prevent falls of older persons [Jagos & Oberzaucher, 2008];

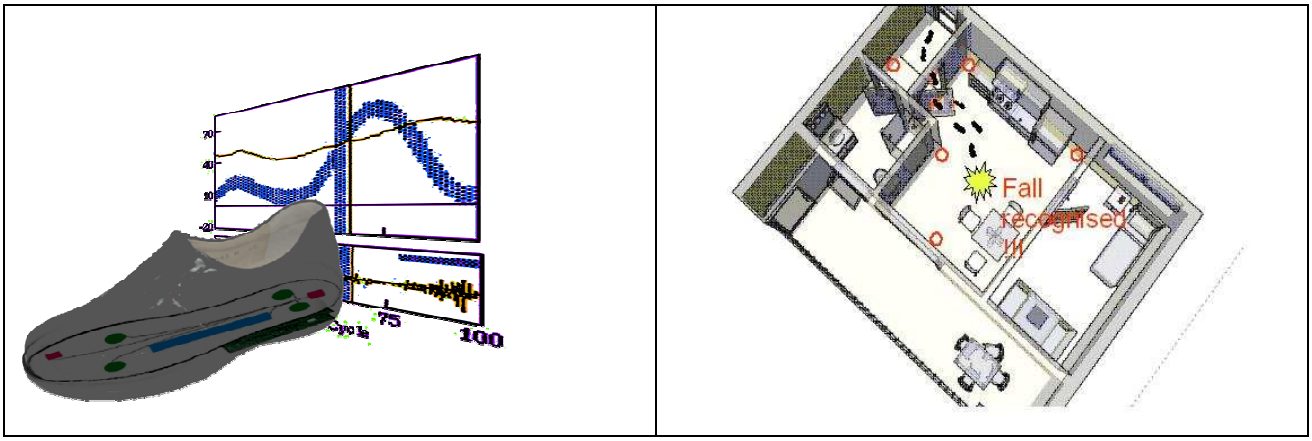

Fig. 2: Research projects in the AAL Living Lab Schwechat: "e-Shoe" (left); "e-Home" (right) aiming at assistive systems to support the independent and safe life of senior citizens in their own home as long as possible

• **"interactive picture frame":** participatory design and development (with intensive end user involvement) of an interactive touch screen based voice of IP phone system for older persons which allows initiating phone calls by just touching the photograph of the person one wants to call to [Panek et al., 2008].

Fig. 3: Pilot study "interactive picture frame" – evaluation of user acceptance of touch screen based easy to use phone system (ordered by TELEKOM AUSTRIA)

• **"Bus Stop 3.0"**: developing of strategies for the enlargement of spatial functions of public transport stops, which will become multi-functional centers and places for interactive information and local supply functions. This "neighbourhood-centre-function" of public transportation stops should boost the acceptance and use of

public transportation. Qualifications, requirements and challenges of this project are developed in the framework of a "Living Lab-Setting".

• **"Demo-apartment for seniors":**establishing an apartment at the local senior's centre showing barriefree dwelling environment and AT-equipment to interested persons (older persons, relatives, professional carers) and acting as a test- and demonstration environment for newly developed AAL-technologies.

Most of these research and technological development projects are ongoing, first projects are already completed successfully. Several workshops in the living lab, real life evaluations in the flats of citizens and several focus groups have been organised. In parallel, the working cooperation between RTD partners, senior citizens and the centre for senior citizens and the advisory board of senior citizens has been established and consolidated.

4 DISCUSSION

The AAL Living Lab in Schwechat started in late 2006. The gained experiences until now demonstrate the high value of the LL approach. The deep involvement of elderly users and carers is bringing significant additional information to the ongoing AAL research projects. Information is gained which most likely would not be available without the living lab based user involvement approach. Additionally, the engagement of the participating stakeholders is very high and the feedback from the senior citizens and care persons is very positive. It obviously is not only the pure research itself but also the general possibilities to be involved in future oriented concrete projects which make it attractive for many senior citizens to actively contribute. Regular meetings between researchers and social institutions have been established and have already proven to be helpful, not only due to the interdisciplinary type of working cooperation but also due to the high amount of information and organisational work which definitively needs close connection to the information flow.

Especially in the mid-term and long-term perspective this is very promising. In the short term it is to say that a large amount of resources and time needs to be invested into the building up of the cooperation inside the living lab. The authors are convinced that the living lab approach is bringing new possibilities for the AT area as it allows to build up an interdisciplinary team including the future users and the other stakeholders and to investigate the real life context the new technology, products and services are to be deployed in. Especially in emerging area of Ambient Assisted Living (AAL) technologies the approach allows to cooperatively discuss and develop solutions in the crucial areas of ethics, data protection and balancing users' wishes for privacy with their wishes to benefit from new technical aids making their life at home safer and more comfortable even in the old age [Rauhala 2003, 2005, 2007], [Zagler et al., 2007, 2009], [Kucharowits, 2008].

5 CONCLUSION

Based on the positive first findings in the AAL Living Lab the current activities were extended from the centre for senior citizens also to mobile care providers and to senior's interest groups in the municipality. As part of the Living Lab activities new approaches for distributing the knowledge about and training on assisted living technologies and products are set up, as the demonstration flat for assistive technology devices. Additionally, international co-operations are established with other living labs and similar projects in other countries to build up a network and to share experiences. The living lab in Schwechat has become member of the European Network of Living Labs (ENoLL, www.openlivinglabs.eu/).

6 ACKNOWLEDGMENT

Ceit Raltec is partly funded by the municipality of Schwechat. The AAL Living Lab described here is part of the larger living lab covering the whole city of Schwechat (www.eschwechat.at). We gratefully acknowledge the support from the centre for senior citizens "Seniorenzentrum" in Schwechat, from the mobile service providers from the city administration, from the advisory board "Seniorenbeirat" and the individual senior citizens who have contributed to the work reported here.

7 REFERENCES

Buehler, C. (2000). FORTUNE Guide - Empowered Participation of Users with Disabilities FORTUNE Guide. Wetter, Germany: Evangelische Stiftung Volmarstein-Forschungsinstitut Technologie Behindertenhilfe.

Bühler; Christian (2001). Empowered participation of users with disabilities in R&D projects. International Journal of Human-Computer Studies, 55 (4), 645-659.

Comyn, G., Olsson, S., Guenzler, R., Özcivelek, R., Zinnbauer, D., Cabrera, M. (2006). User needs in ICT Research for Independent Living, with a Focus on Health Aspects. Brussels: European Commission, Directorate-General Joint Research Centre, Institute for Prospective Technological Studies.

Diermaier, J., Neyder, K., Werner, F., Rauhala, M., Panek, P. & Zagler Wolfgang L.,. (2007). Wohnen mit Unterstützender Intelligenz. IKT-Forum für und mit Menschen mit Behinderungen: Praxis – Forschung – Entwicklung, Johannes Kepler Universität, Linz, Austria.

Diermaier, J., Neyder, K., Werner, Panek P., Zagler W.L. (2008): Distributed Accelerometers as a Main Component in Detecting Activities of Daily Living. In: Proceedings of ICCHP 2008, Linz, Austria

Edelmayer, G., Panek, P., Rauhala, M. & Zagler, W. L. (2006). AAL - Ambient Assisted Living - Thoughts About an Emerging Approach to Support Ageing Citizens in Daily Life. In Österreichische Gesellschaft für Biomedizinische Technik; Schweizerische Gesellschaft für Biomedizinische Technik (Hrsg.), Tagungsband der Gemeinsamen Jahrestagung der Deutschen, Österreichischen und Schweizerischen Gesellschaften für Biomedizinische Technik,CD-ROM. ETH Zürich, Schweiz: de Gruyter.

Eriksson, M., Niitamo, V., Kulkki, S. & Hribernik, K. A. (2006). Living Labs as a Multi-Contextual R&D Methodology. In K. Thoben, K. S. Pawar, M. Taisch & S. Terzi (Hrsg.), 12th International Conference on Concurrent Enterprising,Milan, Italy: Nottingham University Business School.

Jagos, H. & Oberzaucher, J. (2007). eShoe - Sturzerkennung und -vorbeugung. IT-Informationstransfer- und Matchmaking-Event: (Informations-) Technologien für umgebungsunterstütztes Leben,Rathaus, Schwechat, Austria.

Jagos, H. & Oberzaucher, J. (2008): Development of a Wearable Measurement System to Identify Characteristics in Human Gait – eSHOE. In: Proceedings of ICCHP 2008, Linz, Austria

Kucharowits, F (2008) Warum ein Living Lab? – Der Nutzen aus politischer und administrativer Sicht. Presentation at Kick-off conferences to 3rd call for benefit, Austrian Resarch Promotion Agency (FFG), Vienna

N.N. (2004). ISTAG Report on Experience and Application Research - Involving Users in the Development of Ambient Intelligence. Luxembourg: European Commission.

Niitamo, V., Kulkki, S., Eriksson, M. & Hribernik, K. A. (2006). State-of-the-Art and Good Practice in the Field of Living Labs. In K. Thoben, K. S. Pawar, M. Taisch & S. Terzi (Hrsg.), 12th International Conference on Concurrent Enterprising: Innovative Products and Services through Collaborative Networks,349-357. Milan, Italy: Nottingham University Business School.

Panek P., Hlauschek W., Clerckx G.,Mairböck H.,Zagler W.L. (2008). Experiences from Developing an Easy-To-Use VoIP Communication Device For and Together with Senior Citizens in the Living Lab Schwechat; IT – und Telecom Symposium 2008 (Vienna, October 9-10, 2008)

Panek, P. & Zagler Wolfgang L., (2008). Partizipative Entwicklung und Erprobung von AAL Technologien im Living Lab Schwechat. In T. Baehren, G. Finking, A. Hartmann, L. Litz & H. Strehlau-Schwoll (Hrsg.), Ambient Assisted Living - 1. Deutscher Kongress mit Ausstellung - Technologien - Anwendungen - Management, proceedings of 1st German AAL congress,121-125. Berlin, Germany: VDE.

Panek, P, & Zagler, W.L.(2009). A Living Lab for Ambient Assisted Living in the Municipality of Schwechat. In: Miesenberger, K. et al.: Proceedings of ICCHP 2008, Linz, Austria, LNCS 5150, Springer, pp. 1008-1015

Panek, P., Rauhala, M. & Zagler, W. L. (2007). Towards a Living Lab for Old People and their Carers as Co-Creators of Ambient Assisted Living (AAL) Technologies and Applications. In G. Eizmendi, J. Azkoitia & G. Craddock (Hrsg.), Challenges for Assistive Technology, proc of the 9th Europ Conf for the Advancement of Assistive Technology in Europe (AAATE), 821-825. San Sebastian, Spain: IOS Press.

Paugger, H. (2007a). Website of eSchwechat.at initiative http://www.eschwechat.at. .

Paugger, H. (2007b). LivingLab Schwechat: Vom Bewohner zum Forschungsbürger. IT Forum Schwechat: "LivingLab Schwechat: Vom Bewohner zum Forschungsbürger", Schloss Rothmühle, Schwechat, Austria.

Poulson, D., Ashby, M., Richardson, S. (1996). USERfit A practical handbook on user-centred design for assistive technology. HUSAT Research Institute.

Rauhala, M. & Topo, P. (2003). Independent living, technology and ethics. Technology and Disability, 15, 205-214.

Rauhala, M. (2007). Assistive Technology Development, User Involvement, and Ethics: A Case Study. Helsinki, Finland: STAKES.

Rauhala, M., Wagner, I. (2005). Ethical Review - A Continuous Process in an Assistive Technology Project. In H. K. A. Pruski (Ed.), Assistive technology: from virtuality to reality (pp. 31-35). Lille, France: IOS press.

Schrenk, M. & Paugger, H. (2007). eSCHWECHAT.AT: from Transport Hub to Knowledge Hub. Urban Trialogues, Co-productive ways to relate visioning and strategic urban projects - 43rd ISOCARP Congress 2007,Antwerpen.

Schumacher, J. & Feurstein, K. (2007). Living Labs – the user as co-creator. In K. S. Pawar, K. Thoben & M. Pallot (Hrsg.), ICE 2007 Proceedings: 13th International Conference on Concurrent Enterprising,Sophia Antipolis, France: Nottingham University Business School.

Schumacher, J/Niitamo, V-P. (Ed.) (2008) European Living Labs. A new approach for human centric regional innovation; wvb Berlin ISBN 978-3-86573-343-6

Steg, H., Strese, H., Loroff, C., Hull, J. & Schmidt, S. (2006). Europe Is Facing a Demographic Challenge - Ambient Assisted Living Offers Solutions. Berlin, Germany: VDI/VDE/IT.

Zagler, W. L., Panek, P. & Rauhala, M. (2007). The Conflicts between Technology, Acceptance, Ethics and Privacy. Seminar on Assisted Living Systems - Models, Architectures and Engineering Approaches,Dagstuhl, Germany.

Zagler, W.L. (2008). The Name of the Future is User, talk at e-Inclusion Ministerial Conference & Expo, Vienna, Austria.

Zagler, W. L. & Panek P. (2009). Das erste und das letzte Wort haben die Anwender und Anwenderinnen - Beispiele für partizipatives Design bei AAL Produktentwicklungen, in: CDROM proceedings of 2nd German AAL congress, Berlin, Jan 27-28, 2009, ISBN 978-3-8007-3138-1, Berlin; Offenbach: VDE-Verl., 2009

.