Designing, Developing, Evaluating the Invisible? —
Usability Evaluation and Software Development in Ubiquitous Computing

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ABSTRACT

This position paper for the 2nd International Workshop on the Interplay between Usability Evaluation and Software Development (I-USED 2009) introduces some strengths of Ubiquitous Computing as well as some challenges it entails for the software development and usability evaluation; in particular it presents a user-centred design process for ubiquitous computing.

Categories and Subject Descriptors

H.5.2 [**Information Interfaces and Presentation**]: User Interfaces – Evaluation/Methodology; Prototyping; User-Centred Design.

General Terms

Human Factors.

Keywords

Software Development; Usability Evaluation; Ubiquitous Computing.

1. INTRODUCTION

Ubiquitous Computing (UbiComp) provides new opportunities and poses new challenges to software development and the usability evaluation. According to Mark Weiser who coined this term, UbiComp 'enhances computer use by making many computers available throughout the physical environment, while making them effectively invisible to the user' [11]. Instead of explicit input from devices such as a keyboard or a mouse, UbiComp systems typically get implicit input from users' interaction with their physical environment through everyday objects. Besides the advantages of the resulting invisibility and unobtrusiveness for the users, UbiComp entails a variety of challenges for their software development and usability evaluation.

2. CHALLENGES

The challenges that are mentioned in the literature include both the general unobtrusiveness [2], but also the complex interactions that make use of natural input technologies [2] with a great number of interaction partners [4] and through distributed devices [3] in a large physical space [4]. The fact that UbiComp is often seen as everyday computing, which is 'characterised by continuously present, integrative, and unobtrusive interaction' [1] induces further challenges such as highly mobile users [3, 5], interaction on small devices [3], timing difficulties through concurring interactions [10], and environmental factors that cannot be controlled [6].

3. SOLUTIONS

Methods from Human-Computer Interaction (HCI) have already been integrated into software development life cycles, but the process of finding and integrating designated methods into the UbiComp development life cycle is still in its early stages. In HCI, for instance, Jokela [8, 9] has extended the ISO 13407 standard 'ISO 13407: 1999 - Human-Centred Design Processes for Interactive Systems' [7]. This ISO 13407 regulates the design processes of the four phases: understanding and specifying the context of use, specifying the requirements, producing design results, and evaluating the design against the requirements in a loop from the first phase to the last, and then restarting with the first phase in an iterative cycle. We have extended and adapted this life cycle to fit to the specific needs of UbiComp (cf. Figure 1).

A general challenge in integrating methods into the design and development life cycle for UbiComp is to find or define natural and unobtrusive methods that reflect the nature and characteristics of UbiComp and everyday computing. In this 2nd International Workshop on the Interplay between Usability Evaluation and Software Development (I-USED 2009) workshop I would be particularly interested in discussing new approaches for the integration of usability concepts and methods into the software development processes—including traditional single-user systems, cooperative systems as well as particularly UbiComp systems.

4. CONCLUSIONS

Tom Gross is professor for Computer-Supported Cooperative Work and head of the Cooperative Media Lab at the Faculty of Media of the Bauhaus-University Weimar, Germany. His research interests include Computer-Supported Cooperative Work, Human-Computer Interaction, and Ubiquitous Computing. Since beginning of 2008 he is Prorektor (vice-president) of the Bauhaus-University Weimar. From 1999 to 2003 he was a senior researcher at the Fraunhofer Institute for Applied Information Technology FIT in St. Augustin, Germany. He holds a diploma and a doctorate degree in Applied Computer Science from the Johannes Kepler University Linz, Austria.
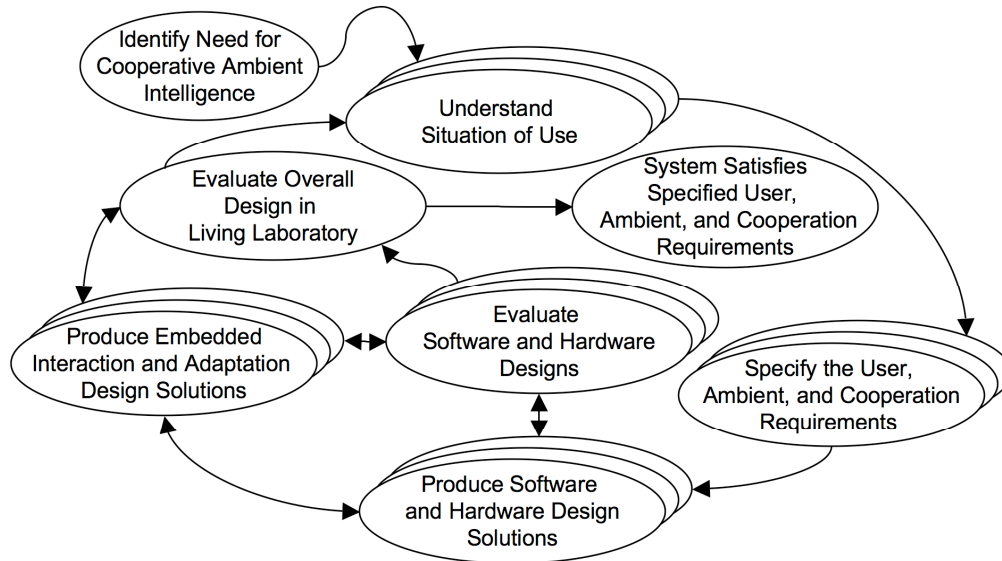
Figure 1. User-Centred Design Process for Ubiquitous Computing.

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