Are Designers Ready for Ubiquitous Computing? A Formative Study

Sara Ljungblad, Tobias Skog and Lalya Gaye
Future Applications Lab, Viktoria Institute
Box 620, SE-405 30 Göteborg, Sweden
www.viktoria.se/fal
{saral, tobias, lalya}@viktoria.se

ABSTRACT
Ubiquitous computing is increasingly becoming reality, even for people outside of research. A group that will have to face the challenges of this new technology is product and industrial designers. To get a designer's view of ubiquitous computing, we demonstrated the *Smart-Its* ubiquitous computing prototyping platform to 16 product designers and collected their impressions during a workshop. Our results show that the way designers approach technology of designers differs from that of researchers, which indicates the need for more comprehensive workshops.

Keywords
Design, Smart-Its, Ubiquitous computing

INTRODUCTION

In the ubiquitous computing vision, we will have computers everywhere, accessible at anytime and used by anyone [1]. One approach that follows this vision is the augmentation of everyday artefacts with computer technology. *Smart-Its* (www.smart-its.org) is a platform used for augmenting everyday artefacts, enabling the building and testing of ubiquitous computing scenarios, as well as the study of emerging functionality. A Smart-It is a small-scale computing device that has built-in sensors (light, pressure, acceleration, sound and temperature) and communication (radio). It can be attached to different everyday objects to provide them with sensing, computation and communication. The platform is mainly developed for use in research. However, if Smart-Its were to take the step into the commercial market, product designers would be directly confronted with the issues of designing for post-hoc augmentation of artefacts and environments. Considering this, we felt the need to explore how practicing designers and design students perceive Smart-Its technology, and how that view differs from ours as researchers. We also wondered what potential role context-aware technology could play in their design work. With this in mind, we decided to conduct a formative study of how designers approach this technology.

STUDY SETUP

Design students and professors of local design schools as well as practicing designers were invited to a demo and workshop. A total of 16 people participated: 12 students (four women, eight men), from the school of Design & Crafts (HDK) in Göteborg and four professionals (one woman, three men). A majority of the participants were specialised in product and industrial design.

CHI 2003, April 5–10, 2003, Ft. Lauderdale, Florida, USA.
ACM 1-58113-630-7/03/0004.

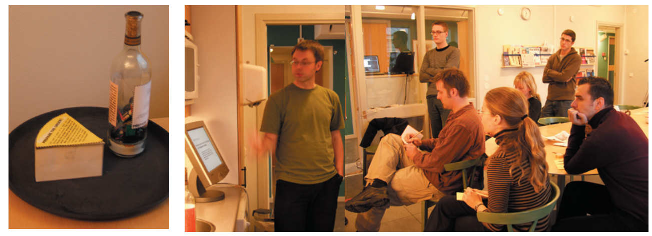

Figure 1: Smart-It augmented serving + demo situation.

INTRODUCING SMART-ITS

The subjects were divided into five groups of two to four people. They were first given a brief introduction to the Smart-Its project, its technology and the objectives of the study. They were asked not to focus on the particular application areas the demos were set in, but to consider the higher-level concepts being illustrated and how they could relate the possibilities that it demonstrates to their work. We also handed out note pads, and encouraged them to take notes during the demo.

The Demonstrations

By showing and explaining the two demos, we illustrated the following high-level properties of Smart-Its technology without naming them explicitly:

- *post-hoc augmentation of everyday objects*
- *context-awareness and self-monitoring*
- *ad-hoc networking of items*
- *collaboration between artefacts*
- *implicit interaction*
- *ad-hoc grouping of artefacts*

Restaurant Application Demo

This demo focused on possible applications in a restaurant setting. It consisted of an interactive environment installed in the kitchen of our lab. Manipulating food items and other props equipped with Smart-Its triggered three illustrative video scenarios:

1. A bottle of wine sensing its treatment. When handled in the wrong way (e. g. shaken), the price of the wine

would decrease to a certain level and then slowly increase again as the sediments would settle.

2. Oysters and cheese keeping track of their own life cycle, quality decay and treatment, comparing their state with similar food items, and initiating oyster auctions when their dynamically updated best-before date would approach. Exposing the oysters to rising temperature when the door of the fridge was kept open would trigger this scenario.

3. Preparing an order by putting cheese and wine on a tray and moving it. When the items sensed their identical movement, they would group themselves into a full order. The order would then keep track of their temperature and notify the waiter when they were ready to be served.

Furniture demo

This demo showed pro-active instructions for furniture assembly [1]. The assembly of the pieces was monitored by Smart-Its and instructions appeared on a computer screen.

Questions and Discussions

Following the demonstrations, we engaged the participants in one-hour sessions where two moderators sat down with them to encourage a discussion about the technology, the possibilities of Smart-Its and ubiquitous computing scenarios in general.

The first four groups were given papers with a few keywords about the Smart-its functionality printed on them. We asked the participants to stick their notes from the demo on those papers and complement them with any other thoughts, questions or ideas that the demo triggered. The keywords 'Aware of its own status', 'Aware of its environment', 'Can talk to each other' & 'Can collaborate', were intended to help the participants to refer to the functionalities showed in the demo. Their own notes were meant to encourage a group discussion, as well as help them to remember the demo.

For the last group discussion, we decided to use empty Post-it® notes as props, which were placed on the paper with the keywords. The idea was that a Post-it note would represent a Smart-It. In this way the participants would be able to more easily imagine attaching a Smart-It to some surface when discussing the technology.

RESULTS FROM THE STUDY

A Designer is not A Researcher

The designers tended to have a goal-oriented, problem-solving approach to the context-aware technology, rather than the more exploratory approach that is common in research. The idea of developing applications for already existing objects by augmenting them *post-hoc* was not considered very appealing. Seeing the object's perspective, through its *context-awareness and self-monitoring*, also appealed to very few, as the majority of the designers kept a focus on the user's perspective. Several participants were concerned about the size of Smart-Its and even found it unnecessary to attach an assembly of general-purpose sensors to a product.

The designers discussed several ideas for products that could sense their context. However, they mostly came up with ideas that focused on the sensing capabilities of a single product, thus neglecting the possibilities for *collaboration between artefacts*. Only one of the groups gave an example of a scenario were *ad-hoc grouping* of objects was used.

We introduced the possibilities of using Smart-Its as a tool to be used during a design process, and discovered that none of the participants had any hands-on experience of sensor-enhanced prototypes. Although they valued a high-level understanding of the Smart-its technology, they did not regard it as a possible design material or tool for making smart artefacts. Instead, some suggested that a Smart-It could be used as a multi-tool that e.g. could help them to monitor the building of their models.

Using Props

The group using props came up with the grouping scenario, and actually discussed more concrete ideas and scenarios for post-hoc augmentation of existing products than the other groups. They took off the Post-it notes of the paper to show how they imagined that they would stick them on to things. This group also tended to focus less on size constraints.

CONCLUSIONS

We feel that there is a significant difference between researchers and product designers when approaching context-aware technology. The designers were interested, but viewed Smart-Its as a collection of sensors belonging to an end-product, rather than something that could be used as a material during the design process, to explore and learn about "smart" products. This suggests that these particular designers were only interested a conceptual understanding of the technology, not a hands-on understanding of it. The question is whether such conceptual knowledge really is enough when designing "smart" products.

Props seem to be an appropriate metaphor to help the participants think beyond the current constraints. This and the overall enthusiasm of the designers towards Smart-Its technology encourages us to arrange more thorough hands-on workshops to explore the high level concepts of Smart-Its. We believe that there is much more to learn from confronting designers with ubiquitous computing technology, for both parties.

ACKNOWLEDGMENTS

We thank all the designers and design students for participating. We thank Tobias Rydenhag, Magnus Nilsson, Ramia Mazé, Stavros Antifakos, Lars Erik Holmquist and Johan Lundin. The Smart-Its project is partly funded by the EU through the Disappearing Computer Initiative under contract IST-2000-25428.

REFERENCES

1. Antifakos, S., Michaelles, F. & Schiele, B. Proactive Instructions for Furniture Assembly. In *UbiComp 2002: Ubiquitous Computing*, Springer 2002.
2. Weiser, 1991, The Computer of the Twenty-first Century. In *Scientific American*, Sept. 1991, 94-104