

# Designing Skin Probes through Reflective Practices

Konstantia Koulidou, Henrike Feckenstedt, Wafa Said Mosleh and Stefan Manojlovic

MSc IT Product Design

University of Southern Denmark

SDU Design, Mads Clausen Institute for Product Innovation

kokou12@student.sdu.dk, hefec10@student.sdu.dk, wamos09@student.sdu.dk, stman13@student.sdu.dk

## ABSTRACT

This paper gives insight to a three-week project bringing together first and second year students of the IT Product Design graduate program at the University of Southern Denmark. The project had two objectives. The first objective was to develop a probe, which reveals the wearer's emotional state of stress and thus creates self-awareness and empathy. The other is to develop tangible tools that help documenting the design process, as well as encourages reflection on the team collaboration. Three tangible reflection tools were developed. The main objective of this paper is to discuss how designers can benefit from designing tangible tools for reflection to critically relate to the outcome of the design process. The goal of the tangible tools developed was to highlight the importance of individual reflection during the design process within an intensive workshop setting where participants, who have not worked together before, come together and try to define their roles within the team.

**Keywords:** Probe; Design Process; Tangible Reflection Tools; Smart Textiles; Collaboration.

## 1. INTRODUCTION

### 1.1 Designing a Skin Probe

As technology becomes increasingly pervasive, it influences the way we relate to our body, interact with others and our environment. As Löwgren and Stolterman [6] state, these technological developments produce new kinds of considerations for us as interaction designers. The aim of this research is to trigger discussion about the perception of the human body and the self.

During an intense three-week project period the aim was to develop a probe in the form of a clothing item that would be able to give the wearer feedback about his intrinsic emotions and trigger him/her to reflect upon that. Probes have been defined in various ways. There are different sorts of probes such as 'Cultural Probes' [4] and 'Technology Probes', which elicit, encourage and provoke [5]. Cultural probes, for example, tend to involve a single activity at a particular time and gather data about the users. These probes do not necessarily imply technology themselves; however, Technology Probes involve the installation of a technology into a real user context over a longer period of time. By reflecting on the participant's use of the probe, researchers gather information about the user. In this paper, the notion of Skin Probes is closely aligned to Dunne and Raby's [3] critical design practice through provoking technologies that are introduced to explore the

relationship between people and electronic devices; however, in this context technology is used as a tool to stimulate reflections about the self, through the interaction with an object. Both the cultural and the technology probes include kits of materials such as disposable cameras and diaries to inspire people to reflect on their lives in different ways and open new spaces for design; however, in our project the probe itself is used as a tool to provoke discussion. In this sense, the probe was a visible way of creating self-awareness, and to mediate the wearer's emotional state.

Alongside the development of the probe, several reflection tools were designed and tested to explore the benefits of applying them during the design process in order to enhance team collaboration. They were brought into the design process itself as well as the spatial organization, as we argue that the space in which designers work affect their work and the process equally. The strong sensitivity to the spatial exploration of the work environment was another characteristic of the project.

Even though similar wearable projects have been implemented in the past (e.g. Diana Eng's Inflatable Dress, aireFORM at MIT Media Lab which was presented this year at TEI 2014 Conference), this paper contributes with the development of reflection tools parallel to the design process.

### 1.2 The Value of Reflection Tools

Based on the premise that the design process in this project was run as two parallel but interrelated activities, reflection on the development was crucial for the project to become successful. With reference to Schön [7] ongoing reflection in professional practices is essential, as it allows for professional and personal development, as well as increases practitioners' capability of completing successful projects. Furthermore, Scrivener [8], states that reflection is essential to practitioners, since it allows for them to record their actions, the consequences of these as well as the responses; all of this mainly to improve the quality of designers' everyday practices, and to assist them in positioning themselves critically towards the process and the outcome, whether it being a system, a product or a simple probe.

Although the power of reflection has been a long investigation by various researchers and theorists, e.g. Schön [7], there is the argument that designers lack helpful tools that embrace the documentation as well as reflection on the design process [2]. Based on this notion, the aim of the project was to develop these

kinds of tools that support a process of several iterations, and enable designers to record moments of reflection that can assist them in improving their design practices.

This research investigates which tools that can be introduced to practitioners in order to capture moments of reflection during the design process, possibly concerning the striking issues of spatiality and collaboration.



**Figure 1:** A reflection tool that captures all steps in the design process.

## 2. MATERIALS AND METHODS

In this study we follow an experimental design research method. As the project was running, the multidisciplinary group of seven students was divided into two smaller teams. One team was working on combining interaction design and textiles, whereas the other group focused on documenting the design process as well as designing tangible tools for reflection. The groups were flexible in their composition of students; all students worked in both groups according to their preference at a time. Our approach was an experiment on researching how tangible reflective practices influence the design process. With this study we will argue that the reflection tools helped the practitioners to define their role in the process and trigger discussions about spatiality and collaboration along the way.

### 2.1 Designing the Probe

The probe was designed to create self-awareness and reveal the wearer's emotional state. According to Wilde [11], by extending the body outwards, we paradoxically extend attention inwards. We designed a piece of clothing, which can contract and expand according to the intrinsic emotional state of the wearer. While exploring we focused on measuring the stress response related to the changing body temperature of the hand. We applied a temperature sensor to sense the increasing body temperature, after

which it was to trigger the transformation of the wearable probe. The collar shrinks, with the help of a servomotor, leaving the neck open whereas the shoulder is expanding with the use of an air pump inflating an air balloon (Figure 2, 3).



**Figure 2:** Low stress levels – initial position: Collar is up, shoulder pattern aligned to the body



**Figure 3:** High stress levels trigger transformation: Inflation of shoulder pattern, and the collar shrinks.

### 2.2 Designing Tangible Reflection Tools

In order to document the design process, we propose transformable tangible models that can trigger reflection on the ways in which students work and collaborate, the space where they work as well as on how the space may influence their design practices. In terms of reflection we found it useful to ask ourselves how we work, where we work and what are we doing?

**How we work:** In a group of students with different cultural and educational backgrounds we found it crucial to trace and identify the various forms of collaboration. Individual ways of working, developing and contributing individual skills as well as defining a role in the group was a concern of all the members of the group.

**Where we work:** Where we work played a major role in the design outcome. Different spaces facilitate different activities and provide various materials and possibilities. We were experimenting with working in different places, meaning that we changed locations for different activities to support the exact task we were focusing on. Furthermore, we reconstructed the perfect work environment of every group member with mock-ups that mapped out our favorite workspaces (Figure 5).

**What we are doing:** The collaboration within the three weeks was determined by a constant negotiation of interest and skill as well as time constraint. What is desirable but also possible in the given time? Finding one's role and responsibility within the team, as well as engaging and developing further in discussions as a whole team was challenging. We facilitated brainstorming and discussion through various process tools such as mapping out current research and status quo projects as well as experimenting and exploring different materials when it comes to textiles and folding techniques, and technological devices such as Arduino, Lilypad and Makey Makey.



Figure 4: Design process

### 3. RESULTS

#### 3.1 The Probe

The probe opens up discussion about the role of technology in the field of fashion design. Technology adds one more layer to the clothing and thus extends the body outwards. Clothes usually hide our body and protect us from environmental influences. The question we asked ourselves was now: What if they could reveal our feelings instead, and make us aware of our emotional state? By combining interaction design and fashion design, our probe is a contribution to the coming together of technology and textiles, creating meaning for the wearer.

#### 3.2 The Process

The reflection tools were used as experiments along the way, and stayed in the background. At first, however, those tools were moved to the foreground towards the end of the project, in the final reflection of the course, and triggered reflection among all participants. For the final reflection, we designed a tool to encourage discussions on how the different reflection tools could have been used in a different way or at different moments during the process. Different colors were used to represent the different topics that the students documented throughout the process. Green represents everything related to the workspace, blue represents everything related to collaboration and grey relates to materials. As the design process is never a linear process [9] and does not always proceed sequentially, the cell shape of the cards was flexible enough to create new connections between space, collaboration and materials. During the first week of experimentation and exploration frustration emerged amongst the group members. The group experienced the different moments in

various ways. The frustration was rooted, for instance, in different expectations and different work behaviors. One of the group members articulated: *"You like experimenting, I like plans and follow them up. We are so different"*.

The spatial affordances and the facilities proved to be important for the design process only by the end of the project. It was hard for the members to see the value of moving to another space spontaneously. The final reflection revealed that using the reflection tools was not as helpful, since they were not meaningfully implemented further and thoroughly. The value and relevance of the reflection tools seemed to be obvious only towards the end for some, reflecting and looking back.



Figure 5: Experimenting different workspace environments.

### 4. DISCUSSION

As mentioned before, the main goal was to design a probe and thus the appearance of the wearer, resulting in raising self-awareness, caused by stress. Although, the intention of the probe was to relax the wearer by giving comfort, the probe opens up discussion on the relation that we have with our emotional state and the level of public expressiveness. Does the probe overstress the person who is wearing it? In the setting of a job interview, if the interviewer is wearing the probe to create empathy, how is it going to influence the interviewee's stress level? These are questions that seek answers and are material for further investigations.

Our first stage was devoted to identifying the field of research, brainstorming, ideation and conceptualization, where we decided to work in the field of smart textiles and emotions. Smart textiles - also defined as textiles capable of sensing and reacting to external factors such as bodily or environmental factors - make the user acknowledge several conditions. In the early stage, when trying to find the perfect probe through examples of videos and pictures, we assumed that changing or re-arranging the working environment would influence our own inspiration and motivation. In a group of seven people, different workspaces were used as a stimulator for motivation and creativity such as big atriums, the textile school, electronic labs, small offices with glass walls and thus a wide range of light and design studios with sofas and

music. At first, the efficiency in different spaces was put in the background. Looking back at the traces, some participants were satisfied with changing spaces. Mostly because creativity and great ideas are results of hard work but also inspiration, and inspiration itself is a result of exploration: changing spaces and searching for new matters helped participants setting the goal. For others, changing the work environment was stressful since they prefer something stable. Following up activities in different spaces throughout the project would have been helpful in order to allow comparison on how the space may influence different activities and practices. We discussed that the models of the preferable work environment could be the trigger for the students to change spaces, according to specific preferences. In that sense, students could be the facilitator of their preferable space, by organizing the physical space. The individuals "perfect" space could influence the rest of the team in terms of productivity.

Throughout different stages of the design process we realized that we work differently, and that the different workflows would affect our final probe. During the final reflection, we came up with the idea that an activity in the beginning of the project may open up discussion about how people prefer to work. Instead of creating the model of emotional transformations, models for the way we want to work and collaborate can be useful for the team members establishing a common ground and understanding in the very beginning of the collaboration.

We argue that it is valuable for design practitioners to question themselves about issues of collaboration and spatiality and experiment throughout the design process with tangible reflective tools. One of the biggest challenge was to convince all the members of the group that to work by experimenting and reflecting. We cannot argue that we designed tools that designers can use for their design practices, but we can argue that by an ongoing reflection upon the collaboration and spatiality are triggered designers to question their role in the team, their skills, and their competences.

## 5. CONCLUSION

This paper presents a design exploration between technology and textiles, with a great focus on documentation and reflection on the design process, which is claimed to be crucial for the collaboration and its results. Reflection and interaction is essential linking people with multidisciplinary backgrounds throughout the whole design process in order to determine, pursue and achieve a goal successfully. Alongside the wearable design probe, three tangible reflection tools were developed, each reflecting on the design process from a different angle. The tool reflect on how every team member experienced the collaboration within one week individually, how different working environments are preferred, and why that even matters. They invite for common, joint reflection on the entire design process and open up discussion about what could have been different if a choice was made differently.

The purpose of the current research was not to find out the best design process but to highlight the importance of process documentation and encourage design practitioners to use tangible reflection tools in the design development.

## 6. ACKNOWLEDGEMENTS

We would like to express our thanks to the rest of our team members: Ye Shen, Anne Holm Nielsen and Ann May Fjeldsted. Also, thanks to EUC Syd in Sønderborg for providing materials and equipment for the designing.

## 7. REFERENCES

- [1] Carere, Claudio, and Kees van Oers. "Shy and bold great tits (< i> Parus major</i>): body temperature and breath rate in response to handling stress." *Physiology & behavior* 82.5 (2004): 905-912.
- [2] Dalsgaard, Peter, Kim Halskov, and Rune Nielsen (2008), Maps for design reflection. *Artifact* 2.3-4 176-189.
- [3] Dunne, A. and Raby, F., (2001). *Design noir: The secret life of electronic objects*. Springer.
- [4] Gaver, W., Dunne, A., (1999). Pacenti, E. *Design: Cultural Probes*. *Interactions*. Vol. 6, No. 1: pp. 21-29.
- [5] Hutchinson, H., Mackay, W., Westerlund, B., Bederson, B.B, Druin, A., Plaisant, C., Beaudouin-Lafon, M., Conversy, S., Evans, H., Hansen, H., Roussel, N. and Eiderbäck, B. *Technology probes: Inspiring Design for and with Families*, in Proc. of CHI'03 Fort Lauderdale FL, ACM Press, 17-24.
- [6] Löwgren, J. and Stolterman, E. (2004). *A Design Perspective on Information Technology*. The MIT Press: London, England.
- [7] Schön D. (1983). *The Reflective practitioner. How professionals think in action*, London: Temple Smith, 1983.
- [8] Scrivener, S. 2000. Reflection in an on action and practice in creative-production doctoral projects in art and design. *Working Papers in Art and Design* 1. Available online at: [http://sitem.herts.ac.uk/artdes\\_research/papers/wpades/v011/scrivener2.html](http://sitem.herts.ac.uk/artdes_research/papers/wpades/v011/scrivener2.html) (Accessed 08.10.13).
- [9] Stickdorn, M., Schneider, J., Andrews, K., (2011), This is service design thinking: Basics, tools, cases., Wiley Wilde, Danielle, Thecla Schiphorst, and Sietske Klooster. "Move to design/design to move: a conversation about designing for the body." *interactions* 18.4 (2011): 22-27.
- [10] *The Process of Design Squiggle* by Damien Newman, Central Office of Design. Retrieved February 10, 2014, from <http://v2.centralstory.com/about/squiggle>.
- [11] Wilde, Danielle, Thecla Schiphorst, and Sietske Klooster. "Move to design/design to move: a conversation about designing for the body." *interactions* 18.4 (2011): 22-27.

