THE ID-STUDIOLAB 2005-2010

Further developing a creative research environment

Aadjan van der Helm, Pieter Jan Stappers, David Keyson, Paul Hekkert
ID-StudioLab
Faculty of Industrial Design Engineering
Delft University of Technology
Delft

Introduction

ID-StudioLab is a design research community at the Faculty of Industrial Design Engineering at Delft University of Technology. It was established in 1999, as a creative design research environment for researchers, university staff and master graduate students. Each member works on his/her own project but in a collaborative and multidisciplinary setting. At the time it was a unique initiative that through the years has gained a wider acceptance nationally as well as internationally.

This paper presents the ID-StudioLab research approach and organization, discusses the research themes and illustrates this with example projects. Then we will discuss the future directions for the research within ID-StudioLab.

Research approach and organization

ID-StudioLab promotes a tight fit between design and research: researchers become actively involved in the design process, but also designing as an activity becomes an integral and equal part of the research process ('research through design'),. (Hekkert, Keyson et al. 2000) (Pasman, Stappers et al. 2005).

ID-StudioLab started as a design research community with the purpose of joining researchers, students, and educators in the department ID, whose work was 'user-centered and design-driven'. Its active membership has hovered between 20 and 40 people, half of whom had their primary desk in the studio. On purpose it was set up to cross boundaries between groups in the department. Part of its vision was to adopt the mentality and ways of working of a design studio, rather than an academic monastery with isolated scholars in silent and separated rooms.

As a consequence, the lab facilities (Figure 1) should bring together people working on different projects and from different perspectives in a single space with rich opportunities for seeing, demoing, participating in, discussing, fertilizing and questioning each others' ongoing work. This requires an integration of office space and workshops, and originally started with a single room full of people and a workshop room for tinkering and messy tasks. With the move to a new building, ID-StudioLab was housed in a block of 5 adjacent spaces: StudioMingle for people's desk work, StudioMake for electronics, StudioDo for tinkering, StudioSay for presentations and workshops and StudioTalk for data analysis and quick meetings. Over the years the makeup of the ID-StudioLab spaces was enhanced from the original white standard university office rooms into a visually stimulating environment of a design studio, with lively colours, full-wall metal whiteboards and projection areas, and diverse opportunities to display work in progress; as the community grew, the corridor outside the studios was included in the workspace as StudioHallway. The ID-StudioLab facilities themselves served subject of our research on design, expressivity, communication and interactive technologies.

The research through design approach has remained the predominant approach for projects in the ID-StudioLab (Hekkert, Keyson et al. 2000), (Pasman, Stappers et al.

2005). Design researchers actively engage with their topics by designing, building and testing product concepts. Generating knowledge from the building process, the product prototypes and the use of the prototypes in context by users. The infrastructure of the ID-StudioLab has been further developed to support this approach. Facilities like StudioTalk, for data analysis of rich contextual data, StudioMake and StudioDo, for quickly building product prototypes and taking these to a level of refinement suitable for real world use. Applications to start new projects in the ID-StudioLab spaces are carefully weighed as to maintain the research through design character, and the benefits they can bring to and gain from the day-to-day contact with other projects.

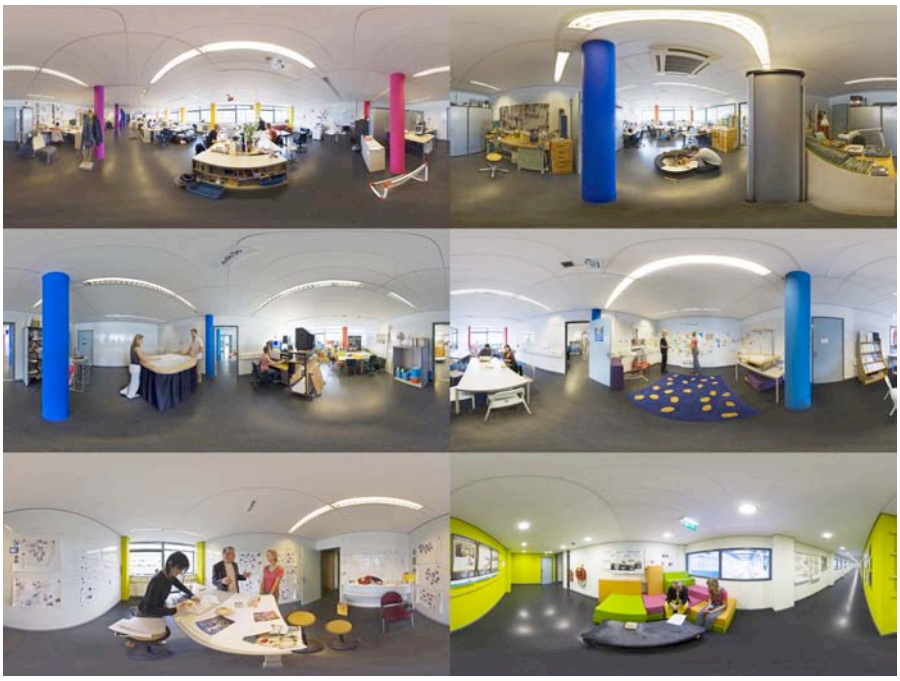

Figure 1. Panorama-photos give an artistic impression of the StudioLab spaces (spaces left-to-right, top-to-bottom in order they are mentioned in the text).

Research developments 2005-2010

In accord with a general restructuring of the research of the faculty, research in the ID-StudioLab has gravitated to fit the new portfolio (Hekkert, Vergeest et al. 2008). This portfolio introduced a matrix structure for the research (see Figure 2), with three foundational columns (strategic design, user experience, and technology transformation) crossed by three applied rows (healthcare, personal mobility, and living/working). Research projects at the faculty take place in one of the columns or row-column combinations.

Most of the work at ID-StudioLab fits in the User Experience (UX) column, with a substantial part in the Living/Working (LW) row. The matrix structure enables various forms of collaborations.

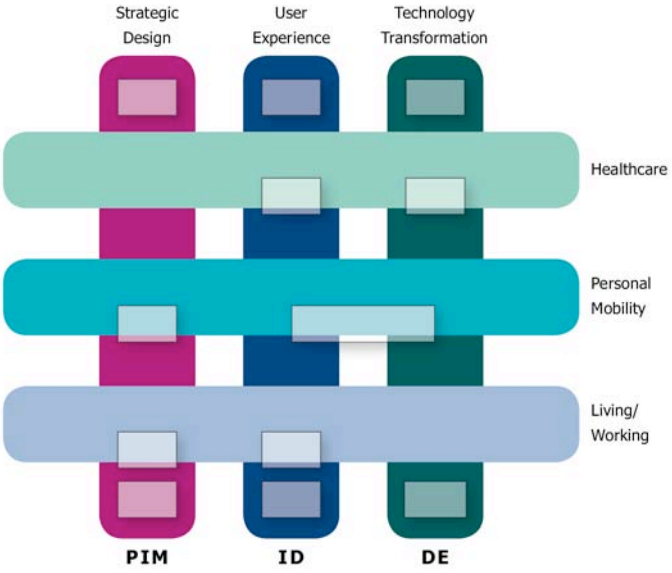

Figure 2. IDE Research portfolio structure

The character of the ID-StudioLab is inherently informal (i.e., it is not 'owned' by any of the groups or particular projects in the ID department). which makes it a highly dynamic environment capable of adjusting quickly to interesting developments. With this knowledge, the 5 themes mentioned below should not be seen as written in stone, impossible to deviate from. The themes rather present an overview of where the currently ongoing ID-StudioLab projects fit in the portfolio. In the next section we present a selection of those projects.

Subprogram	Short description	Project example
Sensory & Cognitive Fluency	investigating how the sensory and cognitive system work (together) in human product interaction. It seeks to expand the capabilities of products and overcome limitations in the design of new technological systems	Geke Ludden, Reinier Jansen
Faces of User Experience: Aesthetics Meaning & Emotion	investigating user or product experience by studying the aesthetic experience, the experience of meaning and the emotional experience. In an integrative approach as well as studying separate experiences in isolation. It seeks to support students and industry to design authentic experiences.	Nazli Cila, Erdem Demir
Contexts Around	investigating how contextual factors,	Froukje Sleeswijk

Us(e): Culture, Situation & Sociability	models, methods and techniques from relevant disciplines can be integrated or adapted for design. It seeks to give designers understanding of the context of product use and to provide the means to make that knowledge operational.	Visser, Helma van Rijn, Nynke Tromp
Usage, Comfort and Safety	investigating user activities, physical and other conditions that influence comfort and the risk involved with product use. It seeks to develop tools and insights to address the situatedness of product usage and to provide inspiration in designing.	Stella Boess
Living/Work	investigates how to design for maintaining and enhancing the quality of live over time as related to environmental, socio-economic and individual life styles. An integral approach is chosen whereby the environment, product role and human behaviour are taken into account.	Martijn Vastenburg, Miguel Bruns Alonso

ID-StudioLab projects

A continuous stream of asynchronous projects is in progress: PhD projects, commercially funded research projects, MSc graduation projects and a diverse range of collaborative project with students. In this section we provide examples of projects.

Bringing the everyday life of people into design: Froukje Sleeswijk Visser

This PhD project (Sleeswijk-Visser 2009) investigated how rich experience information can be communicated in the design process of design practice. In the last ten years many new methods and tools have been developed for generating user data to be used in the fuzzy front end of the design process. First, we have developed a procedure based on user research methods to inform and inspire the design process. This procedure is called contextmapping (Sleeswijk Visser, Stappers et al. 2005) and based on cultural probes and generative techniques. Second, we have investigated how the results of such user research methods can be effectively used in design practice. Contextmapping studies deliver a large and varied set of data and insights, which should inform and inspire not only the researchers who conducted the study, but also other stakeholders (designers, researchers, managers, marketers). In eight different case studies, most of these in collaboration with industrial practice, we have explored several new ways of communicating the data, to inspire designers, let them empathise with users, and engage stakeholders with the data. This iterative process in which new communication tools were designed and evaluated in real practice led to practice-based knowledge which is represented in a theoretical framework (aimed at other design researchers), and concludes a chapter with guidelines, tips and tricks (to serve practitioners) with the knowledge gained during this project.

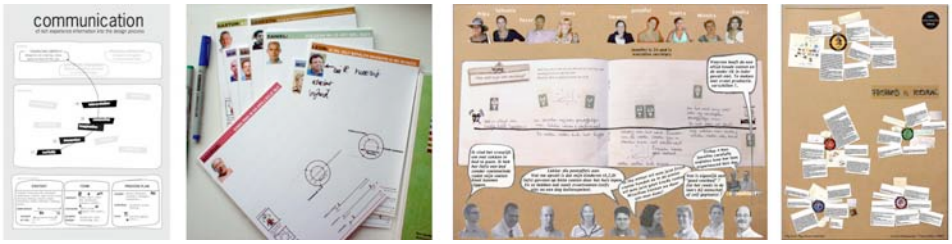

***Figure 3*:** Left to right: user experience communication model, distinguishing three layers of goals, mechanisms, and means. Three communication tools: the personal cardset, web sensitizing tool to engage design team, and action posters for workshop sessions.

Design tools to interact with difficult-to-reach users: Helma van Rijn

Designers need to get closer to the lives and experiences of their users to design products that better fit these users' needs. Especially, when the lives and experiences of users are very different from that of the designer, this need is even more important. For example, it is difficult to imagine the experiential world of people with cognitive disabilities. Reason is that you have never been (and cannot be) in their situation.

This Ph.D. research focuses on direct contact with these 'difficult-to-reach' user groups, and children with autism in particular. Designers need to put more effort in understanding these people's lives, experiences, needs, and preferences. Standard techniques to learn from direct contact with users, such as interviews, observation studies, and generative techniques won't work. For example, many young children with autism cannot talk and are difficult to engage in social interactions. Moreover, they can react strongly to new situations or events. A designer can feel uncomfortable in this situation, especially when he does not have any prior experience with these users. In this case, a designer has to find new ways to overcome these issues by learning from second hand information from caregivers or interacting with these users in different ways.

Aim of this research is to develop tools and techniques to enhance a designer in interacting with children with autism and their caregivers, and thereby bring knowledge about the user group. As a first step, a set of toys was designed, which brought out specific behaviours of children with autism and were tested with M.Sc. design students in an elective course (H. van Rijn, F. Sleeswijk Visser et al. 2009). These toys (or tools) should provide a handhold to structure the interactions and explore the possibilities in interacting with the children. In a next step, these toys shall be redesigned and evaluated with designers.

Implication Design - Artefacts with an intended effect on society: Nynke Tromp

When reflecting on the way we currently live our lives, it is hard to think of an activity in which we do not make use of artefacts. We clearly live in a man-made world. Designers, being the creators of this man-made world, therefore evidently have a big, although underestimated, influence on the way we live our lives (Verbeek 2005). A microwave, for example, clearly functions different than comparable means to prepare a meal, such as a stove. Logically this difference in functioning changes the cooking

process. But what is more striking is that since the coming of the microwave, families appear to share fewer dinners together. Artefacts intervene in social systems, which means they can have a far-reaching effect on social behaviour. Being aware of this influence, opens up possibilities to start designing this influence. This Ph.D. project aims to gain knowledge that is needed to design these far-reaching social implications. As this activity is especially relevant when dealing with issues of social kind, the design cases within this Ph.D. project deal with such issues.

Three design projects have been carried out to explore the possibilities for designers to intervene in issues of social kind. Respectively these projects dealt with social cohesion (Tromp 2007), feminism (Borgonjen 2009) and social safety (Tromp 2010). Figure 3 shows that all three projects used a systemic representation to understand the relationships within their domain and the possible role of the product. Based on these projects, the Vision in Product design approach and additional insights from systems thinking, an initial design method has been developed. Currently four students are testing this method within their graduation project. These students focus on a so-called 'socially weak' area in the Netherlands and aim to develop an artefact with an intended social implication. In doing so various design strategies will be tested that have been defined in an earlier study to existing products with an effect on user behaviour. The development of experiential prototypes will allow evaluation of the intended implication, and hence the success of the method.

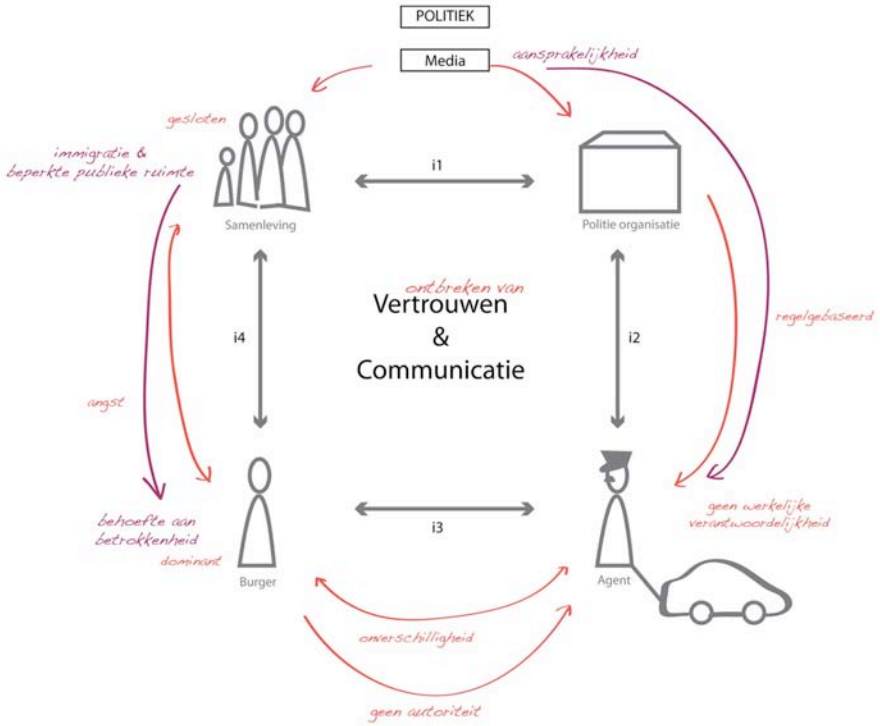

***Figure 4*:** An example of how designers visualize social systems that allow them to understand how products can create social implications.

Metaphor Generation and Experience in Product Design: Nazli Cila

Metaphors are effective tools for communication in design, which are used for expressing and enhancing the meaning of products. They can be used as a means to make abstract ideas concrete and thus turn a complex product into a comprehensible one (e.g. Windows desktop), or they can lead to pleasurable user-product interactions by emphasizing the function, social or cultural meaning, or personality of the product (e.g. Senseo coffee maker).

In order to provide a coherent overview on product metaphors, a framework was constituted gathering the variety of factors found in linguistics literature and adapting them to products through the analysis of various product metaphor samples (Figure 5). In this framework, metaphor is considered as a creative communication process between designer and user. These parties create the metaphorical meaning together since the product metaphor mediates between the intentions of the designer to generate the metaphor, and the experience (i.e. reception, comprehension, interaction, affective reaction, etc.) of the users. In this PhD project, the aim is to have a thorough understanding of these two processes. We will focus on different components of this framework by conducting three studies in which designers will be given several design tasks and the results of each study will be evaluated. Through understanding how designers generate metaphors and how people experience these, we aim to contribute to design knowledge by providing a means of creating pleasurable product experiences, and offer designers the necessary insights and inspiration for designing successful metaphors.

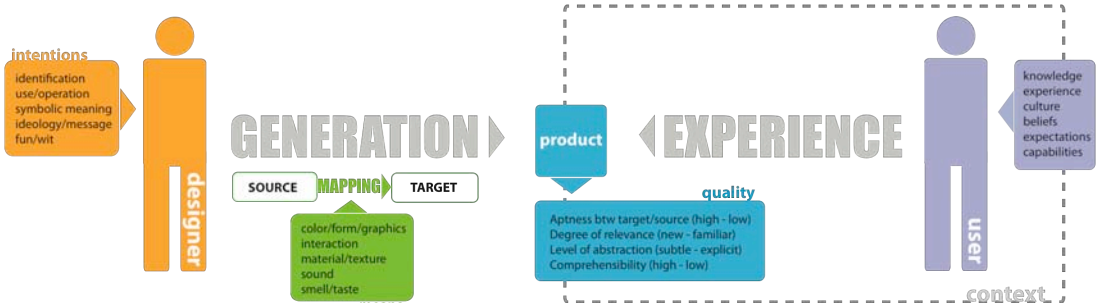

Figure 5: The "product metaphor" framework

Understanding and designing for emotions: Erdem Demir

In the design practice and research domains, there is a growing interest for the emotional consequences of products and services. This can be observed clearly when we look at various conferences and books that focus on the emotional impact of products and at design firm mottos like "form follows emotion". Despite the growing interest, the main issue of designing for a particular emotional consequence has largely remained

uncovered. The raison d'être of this project is to develop theoretical knowledge to support designing to evoke or prevent particular emotions.
The project started with an investigation of how emotions are elicited. In this phase, appraisal theory was selected as the theoretical basis, as it focuses on the main question of interest. Appraisal theory states that emotions are elicited through automatic assessments of the personal meaning of a situation, i.e. appraisals. In this phase, the core issue was to make this body of knowledge operational for designing for emotions. To this end, a framework of appraisals underlying emotional experiences in human-product interaction was proposed.
In the second phase of the project, the focus was on the design for emotion process. The main idea was to explore ways to utilize the theoretical knowledge in the idea-generation process and to identify the needs of the designers in designing for emotions. The basic problem that was observed was the gap between the abstractness of the theory and the concreteness of the object of design. Based on this observation, a questionnaire that allows collecting examples of emotional stories was developed. This questionnaire aims to identify the causes of the collected emotional stories through a questioning sequence that was developed based on appraisal patterns of emotions. The questionnaire can be used for data collection to be used in different design projects, by asking the participants to recall particular emotions relating to those domains (e.g. driving experiences, airport experiences, in the office, lives of elderly) and provides examples pulling the theory to concrete grounds.

Independent@Home: Supporting the elderly at home using aware systems: Martijn Vastenburg, Thomas Visser and David Keyson

With today's technology, elderly users can be supported in living independently in their own homes for a prolonged period of time. Commercially available products enable remote monitoring of the state of the user, enhance social networks, and even support elderly citizens in their everyday routines. Although technology seems to be in place to support elderly users, one might question the value of present solutions in terms of solving real user problems such as loneliness and self-efficacy. Furthermore, available products tend to be complex in use and do not relate to the reference framework of elderly users. Consequently, user acceptance of today's solutions tends to be low. Figure 6 shows three prototypes of case studies that have been conducted within the project. These three case studies are focused on context-aware products; the product behavior is linked to the context of use. The products all aim to merge into the daily routines of the users, thus their effects can only be studied on a longitudinal basis. These field studies require high efforts of the researchers, both in terms of conducting the field study and in terms of developing a robust and functional prototype. With the Independent@Home research project , the ID-StudioLab aims to develop and provide the proper instruments and methodology to support designers. In the project, funded by SenterNovem IOP-MMI, ID-StudioLab collaborates with industry partners and home care service providers. These have participated in a series of design explorations, in which the design space and the user-centered design process have been explored. At the same time, a service platform has been developed [Vastenburg et al., 2009]; this platform enables designers to make design iterations, even when time is limited and the technical requirements are complex. In Figure 6 some examples of developed prototypes are shown. Flowie is a virtual coach which stimulates elderly people to exercise more [Albaina et al., 2009]. A field test showed that people appreciated the feedback by the display and they enjoyed

the interaction with the virtual coach; the system could however be improved by linking the coach to weather conditions. ConnectAll shows a prototype which connects elderly and their informal caregivers. The product has been developed in close collaboration with the elderly and their caregivers. Rather than focusing on supporting the care giving process, the product emphasizes the peace-of-mind by showing day-to-day activities and by facilitating peripheral communication. Snowglobe is a social awareness display, which aims to improve the feeling of social connectedness of elderly people, and thereby contribute to wellbeing. In a field test, participants indicated that they enjoy using the system. It appears to be difficult, however, to measure changes in perceived social connectedness in a quantitative way.

Flowie ConnectAll SnowGlobe

Figure 6: Prototypes developed within the Independent@Home project.

Bringing product use into designing: designer perspectives: Stella Boess

Intended users are often absent in design team meetings. We studied how designers can still engage with and be inspired by user data in such meetings. Previously, we and others found that information about product use should be presented to designers in a convincing, in-depth way, well-rooted in empirical work. Here, we focused on the ways that designers use user data. We compared a design meeting without user data to one in which we presented cards showing user situations and quotes. The design topic was visual reminders in people's homes. We found that the designers used both their own experience and the participants' situations in their designing. They used the photos and quotes from participants to reflect on their initial ideas from the first meeting and added new aspects based on the user data. They preferred to stick to their initial ideas rather than come up with new ones from the data. They did not use the presented materials as a self-explaining source of information, although they confirmed they had enough time to study them. Rather, they asked the researchers to explain and elaborate on the cards to understand the situation better. We conclude that data presentation alone does not enable designers to design empathically. Open conversation is also needed (de Jong, Boess et al. 2007). The participating designers were Froukje Sleeswijk Visser, Daniel Saakes and Jasper van Kuijk.

Sensory incongruity and surprise in product design: Geke Ludden

People continuously experience the world and the objects in it through all their senses. Product designers can influence the way people experience products by paying attention to the multiple sensory aspects of product design. Designing sensory experiences can be

aimed at communicating a consistent message to all sensory channels, making this message a stronger one. The opposite approach, designing a product in a way that incongruent information is provided to different senses, can be used as a means to create surprising products.
In this research project, three types of sensory incongruities were studied: visual – tactual, visual – auditory and visual – olfactory. First results were described in (Pasman 2005). We found that when information from two or more sensory modalities conflicts, this can evoke a surprise reaction as well as feelings of amusement, interest, confusion or disappointment.
In one of our later studies (Ludden 2009), we argued that in concurrence to joke theory, people appreciate and enjoy appropriate incongruities that can be related back to the product, whereas they are confused by and have negative opinions towards inappropriate incongruities. To study this effect, products in two categories, (rubber duckies and deodorants) with (in)appropriate sensory incongruities of three types: visual – tactual, visual – olfactory and visual - auditory incongruities were designed and evaluated.
Both appropriate and inappropriate incongruities were evaluated as surprising and confusing. As expected, appropriate incongruities evoked more amusement and were liked better

Affective tangible interaction: design of a pen that responds to stressful behavior: Miguel Bruns Alonso

Previous research at the ID-StudioLab has investigated a tangibility approach to affective interaction, i.e. how people express emotions through interaction with an alarm clock (Wensveen 2002). Building on this research one may question how products should respond to affective input to influence emotions, which after measuring and interpreting affect, is the end goal in affective computing. Stress, which is considered as a subset of emotions, was selected as context for this research, and fidgeting behavior with a pen was considered as a means to interpret stress. Two pen movements were found to be indicators of stress, rolling and rocking movements (Alonso, Varkevisser et al. 2007).

Figure 7a: Stressful behaviour while fidgeting with a pen
Figure 7b, 7c: Various iterations of prototypes for measuring behaviour and giving feedback through actuators
Figure 7d: Final prototype of the research project (the RelaxPen).

Through a process of research through design, a method frequently applied in ID-StudioLab projects, a design approach was evaluated for how a product could respond to fidgeting behavior to influence stress. Haptic feedback was proposed as a means for product response to this behavior since the modality of feedback is consistent with the input (Wensveen 2004). Thus a pen was developed that responds to stress by adapting its

behavior. The pen fixes or loosens the tip when a rolling movement is made, and it changes the freedom of movement of a ball when a rocking movement is made, providing a change in the perception of balance. Approaching stress from a designerly perspective has opened new and interesting fields for exploration in affective computing, looking at behavior instead of physiology or facial expressions. On the other hand it provides designers with an insight on how to approach the design of responsive products.

Sketching Product Sounds: Reinier Jansen

In our daily lives we are surrounded by product sounds, whether it is the rattling of an electric toothbrush, or the whooshing sound of a washing machine. Contributing to the total user experience of a product (e.g., product functionality, identity, and satisfaction), it is important for designers to consider product sounds. A framework for product sound design related communication has been put forward by (Özcan and van Egmond 2006). This framework essentially states that product sound design should be incorporated from the very beginning of the product development process. Sounding sketches have been proposed as communication method during the conceptual design phase. However, designers currently lack a tool that facilitates sketching of product sounds. Existing tools are focused on musical sounds, and designers are often faced with their limited sound vocabulary when using tools that rely on semantics.

Therefore, a concept for a Product Sound Sketching Tool (PSST) was developed as objective for a master's thesis (Jansen 2009). PSST consists of a dedicated product sound synthesizer, a collection of playful objects, and a table with a web-cam to track the objects on it. Through their visual and tactile designs, these objects serve as physical representations of the synthesizer's virtual sound parameters. For example: the speed of periodic volume fluctuations found at, e.g., washing machines is controlled by adjusting the length of a sine-like leather belt wrapped around two cylinders. In this way, product sound design is made tangible.

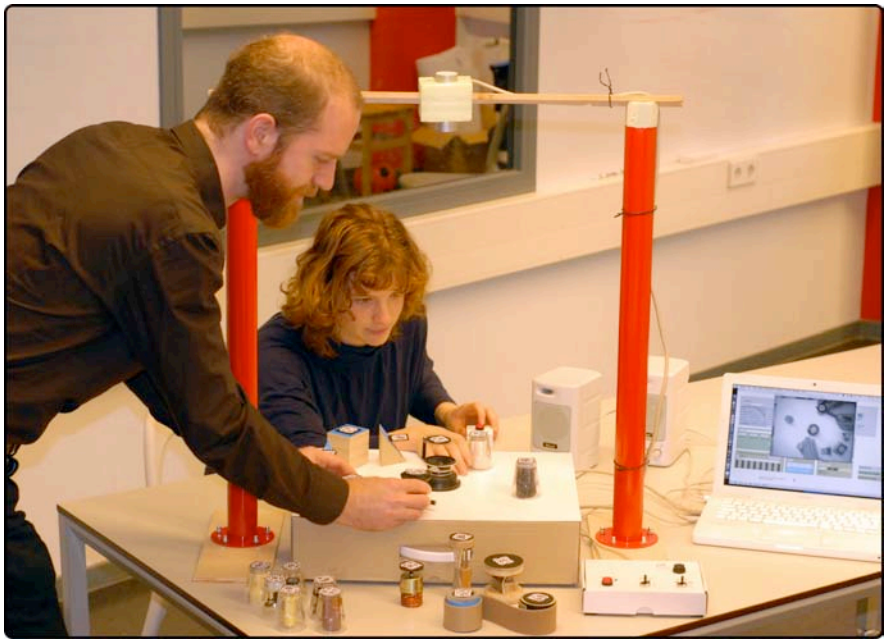

Figure 8. A design session with PSST.

Discussion

The presented projects show the multifaceted nature of ongoing design research at ID-StudioLab. Although ID-StudioLab members are mainly involved with their own specific projects, sharing the facilities of the ID-StudioLab makes cross-fertilization easy – one could say 'intentionally unavoidable'. On a small scale, the "coffee-fetching discussions" contribute, on a larger scale the regularly organized LabTalks, weekopenings, visits by international guests provide a rich environment that continues to inspire members to improve each others work and create new synergies between research strands.

An important partner to the research projects in the ID-StudioLab is the Design for Interaction (DfI) master program of the Faculty. DfI is a 4 semester master programme that aims to educate designers specialized in analyzing and conceptualizing of and in designing for human product interactions in relation to the physical, cultural, technological and societal context in which the product is used (Stappers, Hekkert et al. 2007). Because the education programme and the ID-Studiolab research agenda are closely coupled, this means that a yearly influx of ca. 100 MSc students is confronted with, and get the chance to participate in, the research.

ID-StudioLab members are instrumental in shaping courses and assignments to arrive at interesting work for students. In return, the student work provides interesting cases, inspiration for the ongoing research projects, direct application to designing, and an effective channel to make research findings reach Dutch industry. The MSc. project PSST, mentioned in the section with example projects, makes an excellent case of the benefit of tightly coupling education and research. The course Exploring Interactions in which students learn to conceptualize for interactive products and the course Interactive

Technology Design in which students learn to design interactive concepts by making experiential prototypes{van der Helm, 2008 #20}, are just two examples of education providing inspiration to research and vice versa. Deepening courses allow students to practice their skills at the combination of research and industry, e.g., in the RichViz! elective students can train in contextmapping techniques in close collaboration with companies (Stappers, van der Lugt et al. 2007). In recent years we have collaborated in teaching the design of interactive installations with the Hyperbody group of the Architecture faculty of TUDelft. combining the architectural viewpoint with the product designers viewpoint. The resulting installations have been exhibited at the Science Center of TUDelft and at the Industrial Design Engineering Faculty

Conclusions

Design research is inherently multifaceted and multi- or cross-disciplinary. Therefore crossovers and learning across projects is essential to effectively and simultaneously create situated and generalized knowledge on a cross-disciplinary playing field. Cross-overs should happen in different stages of research: serendipity in contacts, sharing and learning from each others' skills and perspectives. For the next five years, we envisage that the maturing of the new research portfolio and connections this offers, both within the Faculty of Industrial Design Engineering, and with the growing network of academic and industrial partners, but mostly also that it accommodates the research and education passions of those who participate. After ten years of "a design research community: user-centered, design driven", we intend to continue the course of combining people and technology, with products and services, for education and practice.

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