

# Design-by-doing: Workshops for Designing Interaction

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## ABSTRACT

We have been developing methods that will support us, as designers, in approaching the complex and indeterminate factors that come into play in the design of new computational things for everyday life. In our investigation, we have involved students from diverse design educations in workshops inspired by participatory methods. Through hands-on and situated activity formats, these workshops have provided examples and perspectives on working with computation as a design material in combination with experiential notions of materials, use and context.

## Keywords

Design, Methods, Participation, Prototyping, Workshops

## 1. INTRODUCTION

With the increasing ubiquity of computation as a material in the design of new things, the possibilities within the space for design increase exponentially. Designers must learn to work with the complexities of such new materials and its intangible properties alongside mastery of the qualities and craft of traditional, physical materials. In approaching the expanded design space possible with new materials, it becomes necessary to develop a corresponding palette of techniques in design education and design processes.

Computation in everyday things, public spaces and social arenas poses new possibilities and problematics for interaction design. On one hand, methods and models in HCI and engineering developed, for the most part, for explicitly work- and task-oriented contexts may not have the same applicability in designing for everyday life contexts with respect to differences in intentionalities and values. On the other hand, miniaturized, embedded, and mobile computation means that everyday life becomes increasingly characterized by a multiplicity of interfaces and properties, which seems to deny the possibility of (or even need for) a tight 'fit' between a single computational thing and user. And finally, the idea of designing 'new' things carries a fundamental conceptual problematic, since the value of such things can only ever be hypothesized as a factor in an actual experience of use by the (not yet existent) users of such things.

In this situation, designers' notions of 'use' must be approached within a vast space of design possibilities that is characterized by indeterminacy in value, context and 'users'. Design processes and materials, users/use and value must thus be opened to new

potentials and problems, where a plurality of indeterminate factors must be approached together and in an ongoing manner, and where designers must become adept in handling an increasing complexity in both the materials of their craft and situated-ness in the world.

In our recent work, we have been engaging with design students from diverse competence areas in order to work with methods that could address the emerging challenges given the indeterminacy of factors outlined here. In this paper, we will describe three different workshops, in which we work with methods inspired by participatory design to engage in these challenges in education.

## 2. CONTEXT

Much of user-centered design methodology in human-computer interaction is based on models drawn from psychology and cognitive science, with a tendency to frame design problems in terms of means-end logic and individual, goal-oriented actions. Contextual design (e.g., [1]) expands the picture in relation to environments and contexts of interaction by studying existing patterns of use to derive information and potential needs.

Models such as activity theory (e.g., [8]) take into account a complexity of inter-relating and co-evolving factors. Including material things, intangible things such as plans, rules, expertise, culture and experience, as well as processes



Figure 1. Situation and use qualities of an artifact

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such as chains of action and coordinated interaction, this approach considers multiple factors, accumulated both historically through tacit knowledge and through ongoing lived experience, to form a use situation.

In these models, however, there is an assumption that, through observation and analysis, needs can be clearly identified or that users themselves are able to give complete descriptions of their own needs. Alternatively, in the fields of cooperative and participatory design (e.g., [3], [5]), models and techniques based on active formats for participation and ‘design-by-doing’ involve users and designers together in developing concepts alongside evolving, emerging and contextually situated factors throughout a design process.

Inspired by techniques used in participatory design such as drama, games, role-play and props (e.g., [2], [7]), we have been developing and holding workshops for students from diverse design disciplines to evolve concepts by active engagement with complex and indeterminate factors in interaction design.

### 3. Workshops

In this section, we describe three workshops conducted with design students from diverse competence areas, namely product, textile and interaction design. As ‘designers’ of the workshop formats, we formulated the problem and set the stage through worksheets and instructions for interaction among students in relation to materials and sites.

While each workshop had a separate agenda, related to a particular project or a specific stage within a design process, our overall goal was to investigate different approaches to dealing with the complexity of factors in designing for combinations of real and computational materials, users and use situations that were difficult to predict and the indeterminate features of a context or site – put simply – materials, use, and context.

Our approach to engaging each group of design students was to formulate these three factors as structuring elements in workshop formats, so that complexities were addressed either in parallel or aggregated through sequential activities. The core competence of the students was an important factor affecting the structure and orientation of each workshop.

#### 3.1 (Product) Identity Workshop

At the School of Arts and Communications (K3) in Malmö, Sweden, we held a one-day workshop entitled ‘Public Identity’ on March 27, 2003. The explicit goal for each participant was to evolve, from start to finish, their own product concept expressing personal identity and to situate it physically in a specific site in or near the school. Of the 15 students participating in the workshop, the majority had background competence in product design.

##### 3.1.1 Goals

‘Public Identity’ was a hands-on and action-oriented exploration of how to expand and communicate identity concepts. Focusing on designing a public, physical expression of personal identity, our goal was to shift participants away from notions of the artifact to qualities of embodied interaction and contextualization within a site of experience – explicitly putting the typical product crafting and aesthetic criteria out of focus in the design process.

Thus, our workshop format focused on means of discovering and extending ideas of use outside the shape and form of an artifact to

concepts of personal relations and qualities of use within a specific place.

##### 3.1.2 Workshop activities

Workshop activities were conducted in three phases, each accompanied by individual or group worksheets and introduced with instructions from us or group discussion. The first phase involved deep personal exploration – first in a journal-like mapping of personal identity, and then in a hunt for related spatial characteristics in the local environment of the school grounds.

The second phase involved group work – each student joined with one other to share their identity and to find a real space to locate their joint project. In this way, participants had to negotiate and evolve a plan for either combining or co-locating their individual identities, grounded in a communication of similarities or differences in concept.

The last phase consisted of rapid development of low-tech physical prototypes of the concepts by each group. The finale was a presentation to all others using props developed from a materials ranging from textiles, foam, and cardboard and with combinations of techniques including puppet shows and performances.

##### 3.1.3 Outcomes and reflection

A wide range of outcomes as concepts, representations and presentations were generated. While some found it difficult to break away from the familiarity and ‘task-fulfillment’ of industrial design, for the most part the students successfully escaped notions of the formal artifact to explore the meanings and qualities of things used in context. For instance, two students, after extensive exploration of the school’s entrance hallway, built a scale model and ‘performed’ with varying roof surfaces and flashlights to simulate computationally enhanced weather representations (see Figure 1).

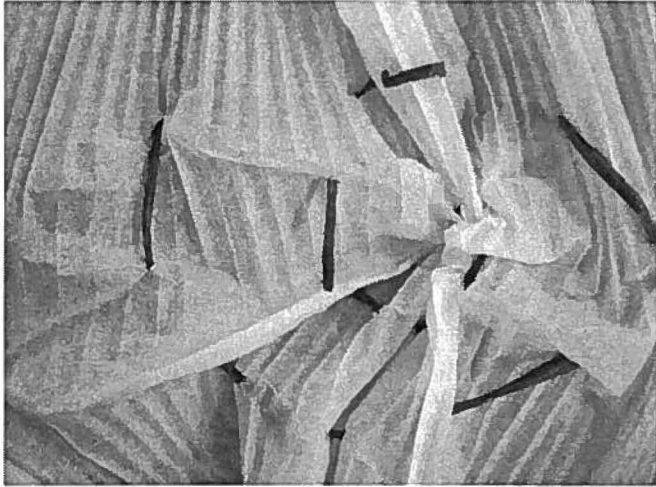
In this workshop, the format was relatively open in terms of concept, characterized by fast-paced shifts in types of activity, for instance between individual reflection to joint action. Without the focus on (or time for) familiar crafting stages, the process brought personalities and relations to the forefront – successfully reflecting in the process as well as outcome the thematic notion of identity!

#### 3.2 Sonic City (Textile) Workshop

On October 13, 2003, we held a one-day workshop at the Swedish School of Textiles in Borås. Taking the context-aware technology platform used in the Sonic City project [4], which creates music based on sensor-perception of biometric, mobile and environmental factors, the goal was to engage eight textile students in working with computational and textile materials as use qualities.

##### 3.2.1 Goals

The ‘Sonic City’ workshop brought a focus on material use qualities at the end of a research project focusing on a technical platform for ubiquitous music creation. The form of the technology, comprising a wearable system for context sensing and processing music, was insignificant since in future smart fabrics and printed circuits would effectively ‘disappear’ such physical manifestations of computation.



**Figure 2. Context perception, use and material behaviors**

Therefore, the goal set for workshop participants was to work with qualities of the use experience – in this case, sensor-based urban mobility and wearable qualities. Our goal was to engage students deeply experienced in craft technique in conceptual and contextual concepts of complex material behaviors.

### 3.2.2 Workshop activities

The first phase of the workshop involved communicating significant aspects of the project. Since the actual system could be quite complex to explain and the prototype overwhelmingly ‘technical’ to see, we focused on communicating the sensor-based computational qualities of change over time and space through video footage. This focused attention on the ‘sound and feel’ of the technology in terms of sonic and situated experience.

The second phase of the workshop involved group-work, where participants collaboratively shared their impressions and thoughts and documented them in scenario formats on worksheets. Brainstorming was structured around three possible directions to ‘materialize’ in textiles the qualities and behaviors of the system – social communication, gestural language and cultural effects.

The last half of the workshop involved rapid low-tech prototyping in textile materials, which were presented in enacted scenarios to convey changes or dynamic behaviors of the artifacts in relation to recalled sites or contexts of use.

### 3.2.3 Outcomes and reflection

The challenge with this workshop format was to strike an appropriate balance between abstraction and inspiration in regards to the technology. The format seemed to get the right balance, though depending on the ‘application’ versus ‘materials’ orientation of each group, qualities explored were geared either towards lifestyle and fashion qualities or dynamic expressions in the materials. An example of an approach to the latter included concepts of tensing woven structures in response to certain sensors (see Figure 2), thus a wearer would feel qualities of physical constriction alongside sonic qualities and contextual aspects of use. The workshop resulted both in new use and lifestyle concepts, as well as deep exploration of material behaviors to feed back into the Sonic City project development.

## 3.3 Prototyping (Interaction) Workshop

For a project called Underdogs & Superheroes [6], we have been working with workshop methods to involve multiple



**Figure 3. Situated enactment using multiple props**

stakeholders in an ideation and design process for architectural-scale interventions in public space. As the fifth in a series of workshops for this project, ‘Game 5’ was a one-day workshop held on February 18, 2003, with seven interaction design students from the IT University Göteborg.

### 3.3.1 Goals

In ‘Game 5’, our goal was to integrate a wide variety of ideas generated in earlier games (many of which were performed in parallel). By bringing the participants in as ‘outsiders’ mid-way in the design process, we were required to filter and communicate previous ideas into a new form of representation, and the workshop was intended as a forum for consolidation, collective reflection and new action.

Our goals for the participants involved taking them out of typical coursework involving linear and analytic processes spanning months, and exploring rapid development of complex ideas within a wide design space. In particular, the focus was on the architectural scale, requiring them to work with new notions of prototypical artifacts and use qualities in order to fully understand the design situation.

### 3.3.2 Workshop activities

The workshop focused on the use of interaction props – physical artifacts representing computational properties. These were seven low-tech interaction props of various size and shape, the physical materials of which varied from plastics and textiles, to simple immaterial properties such as magnetism, sound absorbency and illumination. As representations of modes of use and expression derived from previous games, the props were called ‘superpower prototypes’, setting the stage for suspension of disbelief and quick imaginative engagement with abstract concepts. During the course of the workshop, the props were explored with two particular methods in order to expand and contextualize notions of use.

The first phase of the workshop involved individual scenario-style exploration of a design prop – one prop was assigned to each participant, who was given the role of ‘prototype inspector’ along with a workbook. Each participant was instructed to develop and perform ‘inspection tests’ on their objects, exploring material and immaterial qualities of use – for example, spatial navigation through magnetism: “*Second Sense: prototype model no. Y19 size L : Durable & practical for Invisible forces and yes or no answers...*” This deep exploration of a single object gave each

participant a deep conceptual engagement and expertise with their prop.

For the second part of the workshop, participants took their props into group-work activities in the downtown streets. Following a format similar to a 'treasure hunt', participants had to work together in order to address particular questions or tasks. For each task, they determined which properties of props were needed and where to site the activity – in situ, scenarios were collaboratively enacted, resulting in new, re-combinant artifacts that were 'constructed' through role-play with multiple props over time.

### 3.3.3 Outcomes and reflection

Coordinating pre-designed interaction props, personal scenario work, and collaborative group role-play, the 'Game 5' workshop used methods for participant engagement at various levels in improvisational problem solving. This resulted in new and unimagined behaviors (see Figure 3). In this example, collaborative ideas on-site resulted in students combining prototype 'powers' – the 'sound transmutor' and the 'silencer' – for a re-combinant tool for public expression. The workshop structure successfully enabled group identity formation, personal advocacy and empowerment in the process, and creative generation of computational 'functions'.

## 4. DISCUSSION

In reflecting on the roots and current situation of design practice, the relative distancing between designer and user has greatly increased. Consider, in extreme, the traditional, small-scale craft production that dominated before mass-production in relation to today's realm of design studios and focus group labs. In established design practices, deep knowledge in the material qualities and potentials of materials characterized making new things – today, designers are only starting to learn to work with the deeply complex and immaterial qualities of computation.

In the workshops discussed here, we explored intersections of practices and methods in relations to use. On one hand, we wanted to get designers trained in different core competencies hands-on with the implications of technology use and computation integrated into everyday life. On the other hand, we wanted to explore new relations between computational and traditional materials. Methods involving group-work, enactment, scenarios and interaction props enabled the multiple factors of materials, use, and site to be probed in depth as well as explored in parallel and in new combinations – leading to new design concepts and new relations and perceptions of these factors by the participants.

The main challenges in applying these methods in workshop settings involved negotiating a balance among these factors in the way that ideas were presented to participants, so as to leave an open-enough structure but also some fixed elements for them to frame and orient themselves in relation to. Strategies of putting 'core' design competencies of participants in and out of focus at different times in the process enabled a certain suspension of disbelief so that they could engage freely and quickly, while asserting their expertise and skills at certain necessary points.

While our principle starting goals centered on notions of indeterminacy and complexity in dealing with the design of new computational things, the workshops not only began to provide some methods and ways to approach the design space from new

perspectives, they also opened up new potentials. In getting closer to the sites and qualities of use in design processes, the workshops opened up even more room for speculation, framing expansive and imaginative ideas as well as necessary boundaries for making decisions based on active engagement and experience with the multiple factors.

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