PRACTICE THEORY AND HUMAN-CENTERED DESIGN: A SUSTAINABLE BATHING EXAMPLE

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ABSTRACT

Within sustainable design, researchers and practitioners are developing novel approaches equipped to influence domestic resource consumption in a variety of ways. However, as it turns out, the outcomes of these approaches in terms of their actual effects on sustainability are not quite as desired. This is often taken to be a consequence of rebound effects or unpredicted user behaviour. In an attempt to overcome these limitations, this paper explores the implications of the combination of two research strands, practice theory and human-centred design that may assist designers by going beyond behaviour change and towards gaining an understanding of use practices. Rather than single interactions or activities, practice theory takes socially shared practices as its main unit of analysis; human-centred design works closely with potential future users. The translation of these two starting points in a design approach was explored in a still ongoing exemplar project on bathing that is elaborated on here. The paper closes with a reflection on how the theoretical instruments manifest themselves in the project.

INTRODUCTION

Designers are becoming more aware of their role in the current problems society faces, like for example resource depletion and climate change. They want to take responsibility and as a consequence a range of novel design approaches has come to life, such as Ecodesign (Van der Ryn and Cowan 1996, Brezet and Van Hemel 1997), product-service system design (Manzini et al. 2001) and design for sustainable behaviour (Lockton et al. 2008, Lilley 2009).

As some of the outcomes of these design approaches reach the market, it turns out that achieving desired change through designed interventions can be quite a challenge. There are rebound effects (Hertwich 2005, Herring and Roy 2007), where efficiency gains are counteracted by increases in consumption. Additionally, behaviour oriented methods have difficulties accounting for changes in behaviour or social context. They tend to focus on single product-user interactions and specific moments in time, while in reality design interventions end up in complex social environments that constantly evolve (e.g. Shove 2009).

Our aim in this paper is to provide an exemplar hands-on-approach for the design community to assist design research and practice in grasping and working with the complex relation between design(s) and desired changes in society.

In the paper we will elaborate first on two strands of theory: practice theory and human-centred design. This is followed by an explanation of an ongoing project on bathing that tried to incorporate ingredients of these theories in its approach. Finally, we will reflect on how the ingredients of the two strands have thus far helped to understand use practices and find design opportunities for desired change.

PRACTICE THEORY

Theories of practice or practice theory is a group of theories from sociology. It takes practices, like bathing or cooking as its main unit of analysis. In practice theory, these routine types of behaviour consist of several interconnected elements (Reckwitz 2002). These elements can be grouped in different ways, but a grouping useful for designers, both for its simplicity and explicit inclusion of material elements is the grouping of images, skills and stuff introduced by Shove et al. (2007). Important for understanding practices is to realize that these elements are socially shared; they form loose cultural structures that partly shape (and are shaped by) our ways of living.
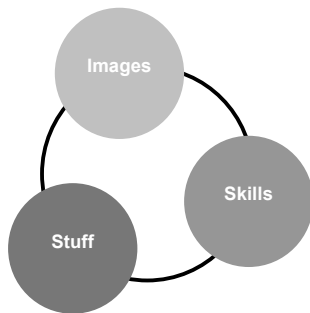

Figure 1: Simplified model of practice with interrelated elements of images, skills and stuff (Shove et al, 2007)

Images are elements that give meaning to the practice, reasons for doing, including ideas of what is normal (and what is not). They are socially shared within a cultural group and often implicit.

Skills are learned bodily and mental routines, know-how, levels of competence, ways of knowing and desiring. They are socially shared through imitation, media, education, informal social interaction and so on.

Stuff groups material elements, including human bodies and human-object hybrids. They are socially shared through (mass) products.

An example of the practice of 'storing vegetables'

Images: Vegetables are healthy, one needs to eat vegetables to stay healthy, rotten vegetables are bad and make people sick, perishable things stay good longer when cooled, etc. But also, ideas of what is a normal or acceptable amount of vegetables to store and eat, when it is too little or too much.

Skills: Ways of cooking and cutting, knowledge of recipes, preferences of tastes, ways of stock management, ways of judging whether the vegetable is still 'good' or not (feel, see, smell, read expiry date), feelings of disgust towards rotting parts, knowing which vegetables 'belong' in the fridge and which not, ways of shopping, etc.

Stuff: Fridges and freezers, packaging (plastic, paper, can, glass, ...), hands, noses, shelves, basements, cupboards, bags, knives (human-knife hybrid) and cutting boards, etc.

Clearly the elements making up a practice are related, for example images of the purpose of cooling relate to routines of storing in the fridge (skills) for which of course fridges (stuff) are required. Viewed the other way around, the wide introduction of fridges has changed habits of storing and images of what is the proper way to store.

Some qualities of practices are interesting to take into account for design:

- Compositions of elements change over time, new elements are integrated and others are phased out;

- Compositions of elements can vary greatly within and between different (cultural) groups and situations;

- Different compositions of elements can result in strongly different resource requirements for the practice;

- Practices are related to other practices.

Examples for storing vegetables

Change over time

With trends of urbanization, globalization, the introduction of freezers and refrigerators, the storage of vegetables has strongly changed. Today for example fewer people know how to pickle vegetables (skills), tools for pickling are difficult to find (stuff) and pickling is now considered eccentric or old-fashioned (image) while it used to be a normal thing to do. On the other hand the relatively recent introduction of avocado's (stuff) has led to skills of judging its ripeness and knowledge on recipes to use them in together with an image as something special but available.

Variety

Indians have very different ways of storing vegetables than Inuit, storing vegetables was different in the 1930s compared to now, someone in a small apartment in the city stores vegetables differently than someone in the countryside with their own vegetable garden and you store vegetables differently than your neighbor.

Differences in resource requirements

To speak in extremes, the resource requirements for storing a precut cabbage from China in a plastic packaging in the fridge (and letting it expire before it is eaten) is quite different from the resource requirements of storing a home grown potato in the basement.

Relations between practices

The practice of storing vegetables is closely related to practices of buying, preparing, eating and disposing vegetables; it can be considered as part of a practice of storing food at home or as a practice of food management. It is related to gardening, working, relaxing at home and so on.

HUMAN-CENTERED DESIGN

Human-centred design (HCD) aims to get a better 'match' of a designer's anticipations with the real world by doing research about and/or closely cooperate with people expected to be future users of the product. Steen et al. (2007) have composed a categorisation of six HCD approaches depicted in figure 2. The horizontal

axis represents the difference between approaching users as subjects on the one hand and approaching them as experts on the other. The vertical axis represents the different orientations within the methods with regard to their descriptive, i.e. looking for problems in current situations, or generative character, i.e. exploring opportunities in future situations.
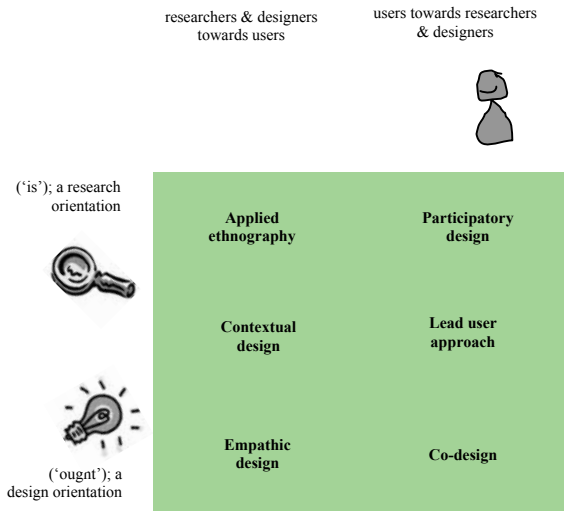

Figure 2: Different HCD approaches (Steen et al. 2007)

Important in applying HCD is to keep in mind that end-users may have trouble speaking reliably about their future needs or future products. Finally, for any successful HCD, Steen et al. (2007) mention essential ingredients to be conversations between designers and future users, multi-disciplinary teamwork and iterations in design and evaluation.

BATHING PROJECT

These two leads of practice theory and HCD were combined in an ongoing project on the practice of bathing. Now completed are two 'experiment'-studies, in which participants experimented with their bathing practice at home (Scott et al. 2009, Kuijer and De Jong 2009), one detailed cultural inquiry about bathing in India, Japan and The Netherlands (Matsuhashi et al. 2009) and a design project in cooperation with an industry partner (Karakat 2009) (Table 1). Based on intermediate conclusions, the next phase of the project will be an iterative prototyping process. The next section will elaborate on these studies.

Table 1: Overview of completed studies (all elements took place in participants' own homes, except for the group sessions)

Study	No. part.	Duration, timing	Elements
Experiment-study I	10	2 weeks, summer '08	Workbook, experiments, blog, group sessions
Experiment-study II	16	2 weeks, fall '08	Workbook, experiments, idea forms, group session
Cultural inquiry	8	1 week, Spring '09	Workbook, action cards, interviews
Industry project	6	2 days, Summer '09	Rough concept testing with existing products

EXPERIMENT-STUDIES I & II

The two experiment-studies had a similar set-up but a slightly different focus. The first study placed emphasis on the dynamics of practice change in the small community that was created for the study, while the second study, although also creating a community of participants, paid specific attention to informing design. At the core of both studies were 'experiments in practice'(Scott et al. 2009: 6). Participants of the study were first stimulated to unravel their own bathing practices according to the elements of images, skills and stuff, in which they were guided by a workbook to be used at home (figure 3). After this deconstruction exercise they were challenged to come up with and try out different ways of bathing in their own homes during two weeks. Some of these bathing styles entailed radically different configurations of elements and actions compared to conventional showering. Examples include washing from a bucket or taking a sponge bath.

Figure 3: example page from one of the workbooks about a bathing experiment involving a bucket (Kuijer and De Jong 2009)

CULTURAL INQUIRY

The cultural inquiry explored bathing in three different cultures: Japan, India and The Netherlands. Participants' bathing routines were described in detail on the basis of self-observation studies by two or three participants in each country. Participants were again guided by a workbook and a set of detailed action cards (figure 4).

Figure 4: cultural inquiry study workbook and action card example (Matsuhashi 2009: 4)

The study resulted in rich insights into different ways of bathing: the Indian seated basin wash where water is scooped and splashed, the Japanese seated soaping ritual preceding an extended soaking in a hot bathtub and the Dutch standing-up shower. An important conclusion in terms of sustainability was also that these styles differed considerably in the amounts of warm water they required, with the Indian way by far the least resource intensive (figure 5).
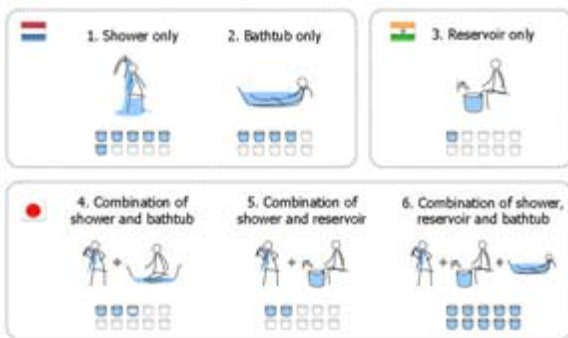

Figure 5: graphic comparing different ways of bathing and their water use in The Netherlands, India and Japan (Matsuhashi, 2009)

INDUSTRY PROJECT

The industry project was executed together with a bathroom producer and distributor. The project took the results from the preceding three studies as a starting point and eventually worked out two concepts. One concept was the 'Scrub', a dry-wash, allowing partial and quick washing at the sink in a wet space like the bathroom with a washcloth or sponge (figure 5). The second was the 'Splash', involving a basin containing warm water, a seated position and a ritual of splashing water over the body with a scoop. Both concepts were tested and evaluated by users in their own bathrooms using readily available products like buckets, stools, cups and washcloths. These tests informed further development of the concepts into detailed designs of supporting products.

Figure 5: storyboard of the Scrub concept (Karakat 2009: 40)

INTERMEDIATE CONCLUSIONS

The study started with an analyses of current bathing practices, which showed that they are highly resource intensive and moving into directions that are increasingly so. Major culprit in this unsustainable practice is the paradigm of continuously flowing water. The dominant way of bathing in The Netherlands is showering. Of course taking a shower is a very pleasant activity, offering qualities like caring for one's body, waking up, relaxing and getting warm. However, water from a shower touches the body only for seconds and then disappears down the drain, still warm and practically clean.

By diving into bathing in history and in other cultures, we found that although daily showering is normal(ised) in The Netherlands, it has become so only during the past fifty years and is not so common in other modern cultures like for example Japan. Furthermore, when experimenting at home, study participants came up with ways of bathing that abandoned the shower paradigm partly or even completely. From these studies we can conclude that showering is not the only possible way of bathing; people are willing and able to bathe in different ways.

One of the potentially pleasurable and considerably less resource intensive ways of bathing resulting from the study was the 'Splash' concept, where water is contained in a basin from which it can be splashed over the body from a sitting position. Study participants experienced this way of bathing as rewarding, effective and relaxing. However, they also reported discomfort, mainly because this way of bathing is currently not supported by Dutch bathroom designs. Therefore a series of supporting products was worked out for Splash (figure 6).

In terms of energy and resource consumption, the Splash concept is clearly different from existing products in the market that aim to reduce water consumption of bathing. These existing products are either technology oriented products like water saving showerheads and recycle showers or behaviour oriented products like timers and feedback on water and energy use (ISH 2009), but all take the concept of showering for granted and require sacrifices on its pleasures. For

Splash, estimations show potential for warm water savings of up to 90%.

Figure 6: Splash concept and supporting products (by Harish Karakat in cooperation with Sealskin BV)

Now the question remains if, and if so to what extent does Splash have potential to be an acceptable alternative for daily showering? And importantly, does it then lead to reduced water and energy consumption without negative side effects nullifying these achievements? To answer these questions, the next step will be evaluating the Splash concept in an iterative prototyping process.

ITERATIVE PROTOTYPING PROCESS

The process will have two cycles of testing, redesign and prototyping and will end with a long term test (figure 7).

The first test will take place with an existing real-size foam model (figure 8). This mock-up will be used to make a physical simulation of a bathing process that involves splashing/sponging imaginative water and sitting down by a variety of test persons, thus generating a wide variety of different use scenarios. Because the set-up requires both rich imagination and low inhibition, the study will recruit participants with experience in improvisation theatre (test 1).

Next, a second, rough prototype will be made that can be used with water. The bathing process will be tested as realistically as possible, but test persons will wear bathing suits. Test persons will be connected for the study as a community, for example through group meetings and a blog. Participants' experiences will be evaluated afterwards in an interview and the amounts of water and energy used will be measured (test 2).

Finally, another re-design will lead to the final, working prototype. The working prototype will allow longer term testing of one to three months in an actual household situation where volunteer participants will use it in their daily life. Special attention will be paid to

exchanges of experiences between different members of the test community. Their actions with the product, their experiences of Splash bathing and the development of novel bathing practices will be monitored together with the overall water and energy consumption of the household (test 3).
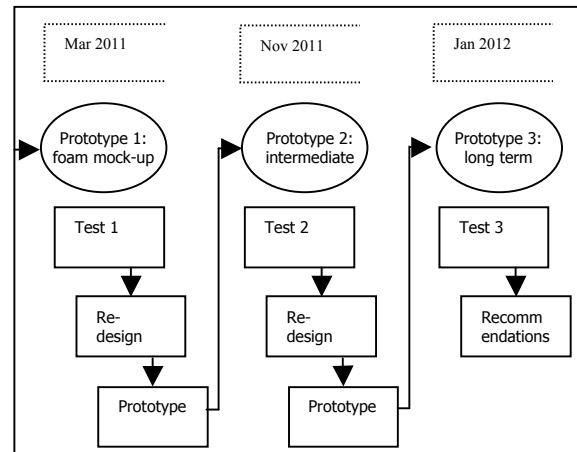
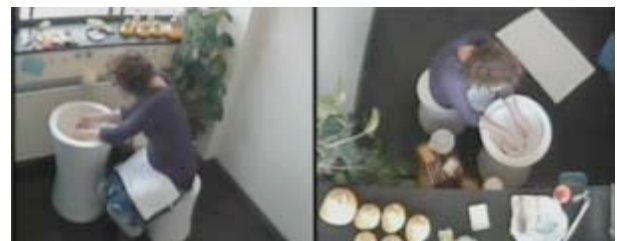

Figure 7: Iterative prototyping process for Splash

Figure 8: Real size foam model and model with test person in simulated bathroom space

REFLECTION

Having explained the completed and upcoming studies, we will now explore how the ingredients of practice theory and HCD manifested themselves within the approaches taken in the bathing project.

PRACTICE THEORY

Focusing first on practice theory, ingredients presented earlier can be summarized as: the images-skills-stuff framework, change over time, variation between cultural groups, differences in resource consumption and relations between practices.

The images-skills-stuff framework was especially used for unravelling current bathing practices; both in the experiment studies, where the framework was intended to guide participants in unravelling mundane routine like bathing, and in the cross-cultural comparison.

No systematic study was conducted into the historic career of bathing, but some literature on the topic was consulted (e.g. Hielscher et al. 2008). Also in terms of changes over time, the iterative prototyping process particularly addresses the Splash practice and design as co-evolving.

Variety in practices was specifically studied in the cultural inquiry, but also emerged in the different experiments of participants in the first two studies. Analysis of variety in practices found clear differences in resource consumption when compared to daily showering.

Finally, although bathing as a practice is clearly related to other practices like for example laundry care, cleaning or having breakfast, the study of these relations remains underexposed in this project.

HCD

From the perspective of Steen's overview of HCD, a variety of approaches were employed or combined. Ingredients can here be summarized as: 'is' or 'ought' perspectives, current or future orientation, reliability of participant's future accounts, conversation, multidisciplinarity and iteration.

The experiment-studies contained both 'is' and 'ought' perspectives. Additionally, an interesting mix was made between users as subjects or as experts. By asking users to observe and unravel their own practices, they were both (their own) subjects and experts gaining insights from their observations.

In terms of the categorisation of Steen, the cultural inquiry was a form of applied ethnography in which participants were instructed into self-observation of their current bathing routines and the industry project entailed co-design (Steen refers to Sanders, e.g. Sanders and Stappers 2008), because here participants were asked to creatively test two new bathing concepts and share their experiences with the designer. The iterative prototyping process will also be a form of co-design. It is clearly future-oriented and test persons will have a large say in adjustments to the design. The experiment studies are difficult to categorize. They included a future oriented element in which participants had to design and perform different ways of bathing, but in this phase of the process designers/researchers were in fact left out completely.

Whether accounts of participants on potential future practices – such as their evaluations of the experiments in the experiment-studies and concept tests in the industry project – were reliable remains an issue of concern. From the studies it became clear for example that it was difficult for participants to let go of the concept of showering and the specific expectations of comfort and cleanliness currently associated with it. For the iterative prototyping process this issue is addressed by working with actors, by creating a social environment (community of participants) that will support the practice change and by a longer term test in everyday life situations.

The aspects of co-evolution, conversation and iteration will also be integrated into the prototyping process, but results are still to be expected.

CONCLUSION

The project presented in this paper has explored two strands of research, practice theory and HCD in their potential for the sustainable design community. Reflection showed that the studies in the bathing project combined different ingredients from both strands.

Some ingredients were underexposed, for example relations between different practices and may thus have left opportunities unaddressed.

What we also see is that the merge led to types of ingredients new to both strands. Practice theory is in principle focused on what is and was, but when incorporated in a design approach future orientations on practices emerge.

Additionally, the merging role of the participant as object and subject occurring in the experiment-studies is new to HCD. Helped by simplified concepts from practice theory, participants were guided to reflect on their own practices. This approach was triggered by the idea in practice theory that novel practices emerge in everyday performance; innovation is seen as an ongoing process of co-construction (Oudshoorn and Pinch 2003) or co-evolution (Shove et al. 2007). 'Users' are then not only experts of their own experiences like in co-design (Sleeswijk Visser et al. 2005), but also designers of novel ways of doing.

Finally, the emphasis in practice theory on the social construction of practices led to an approach stimulating social contact between participants and the creation of ad-hoc communities for the studies, while in HCD participants are normally approached as a set of individuals.

With regard to desired change it can be argued that the Splash concept has potential for having large effects on household resource consumption. However, whether this potential fleshes out in reality has to be determined within the next phase of the project. The prototyping process will form a small scale evaluation of the actual effects of the design in the real world and thus of the practice-oriented HCD approach.

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