

# Practices as a Unit of Design: An Exploration of Theoretical Guidelines in a Study on Bathing

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The sustainability challenges facing society today require approaches that look beyond single product-user interactions. Focusing on socially shared practices—e.g. cooking, laundering—has been identified as a promising direction. Building on a growing body of research in sustainable HCI that takes practices as unit of analysis, this article explores what it means to take practices as a unit of design. Drawing on theories of practice, it proposes that practice-oriented design approaches should: involve bodily performance, create crises of routine and generate a variety of performances. These guidelines were integrated into a Generative Improv Performances (GIP) approach, entailing a series of performances by improvisation actors with low-fidelity prototypes in a lab environment. The approach was implemented in an empirical study on bathing. Although the empirical example does not deal with common types of interactive technologies, the guidelines and GIP approach offer sustainable HCI a way to think beyond immediate interactions and to conceptualize change on a practice level.

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## 1. INTRODUCTION

When it comes to household resource consumption, apart from a number of exceptions, mainstream research in sustainable HCI focuses on motivating people to “act environmentally” through eco-feedback or other forms of persuasive interfaces [DiSalvo et al. 2010; Dourish 2010; Froehlich et al. 2010; Woodruff et al. 2010; Brynjarsdóttir et al. 2012]. Examples are motivating people to take shorter showers or to turn off the lights when leaving a room. Although persuasive technologies have repeatedly been shown to render desired effects, it has also become clear that the extent of change, in terms of scope and duration, is limited [Gram-Hanssen 2011; Van Dam et al. 2010].

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Some authors even argue that feedback devices risk justifying and sustaining energy intensive behaviors. For example, Pierce and Paulos [2010] found that including the energy use of the automatic clothes dryer in feedback devices communicated it as standard, thereby inhibiting the switch to the far less resource intensive line drying, a finding confirmed by Strengers [2011].

Inherent in the field of human-computer interaction, these efforts focus on interactions. In itself this is practically understandable and not a problem, but in combination with the systemic change required for sustainability [Manzini 2009], this focus becomes limiting. Besides tending to tweak behaviors within existing ways of conduct, interaction-centered approaches are ill equipped to take into account the complex and ever changing nature of everyday life [Brynjarsdóttir et al. 2012]. Therefore, sustainable HCI needs to find ways to look beyond interactions.

### 1.1. Practices as a Unit of Analysis

Recognizing this need, a number of researchers in product design and HCI are now drawing on sociological theories of practice. Theories of practice are relevant for the task at hand for several reasons. First of all, sociology has a long history of addressing issues of a societal scale, and theories of practice in particular have proven to be well suitable to understand and explain issues with regard to sustainability (e.g., Røpke [2009], Gram-Hanssen [2009], Shove [2003]). Moreover, because ‘things’ play an explicit role in certain strands of the theory, practice theory is useful to gain a better understanding of how “designed artefacts shape and are shaped by the contexts in which they are used” [Ingram et al. 2007].

The fundamental unit of analysis in practice theory is practices. Practices are the mundane activities that make up most of what people do in their daily lives, such as bathing, cooking, laundering and cleaning, and thus account for the majority of resource consumption. Practices are socially shared entities with a certain persistence over time and space, and are therefore “supraindividual” [Schatzki 2001]. Because a focus on practices lifts understandings of resource consumption to this supraindividual level, taking practices as a unit of analysis can offer insights into opportunities for systemic change. As Brynjarsdóttir et al. [2012] argue, considering energy in the context of broader sociocultural practices rather than focusing on specific, isolated behaviors might be more appropriate to the complex nature of sustainability issues.

Researchers in the design field who have drawn on practice theory propose approaches that gain insights from studying particular practices in society, and present these insights as a way to inform the design of (interactive) consumer products. Examples of approaches are: studying situated practices [Korkman 2006; Julier 2007], tracing their historic “career” or path [Gram-Hanssen 2008; Hielscher et al. 2008; Munneke 2007; Pettersen 2009], studying variety in practices between different cultural groups [Pierce and Paulos 2011; Matsushashi et al. 2009] and combinations of these [De Borja et al. 2010; Kuijer and De Jong 2011; Scott et al. 2011]. To give examples of design oriented insights that result from these types of studies: Hielscher et al. [2008], from an in-depth study into the history of hair care practices, identify how changes in the perception of ‘good’ and ‘bad’ grease have a direct relation to the amounts of water consumed for showering, and Pierce and Paulos [2011], by studying the nonmainstream practices of second-hand consumption, reframe technology consumption as acquisition, possession, dispossession and reacquisition.

### 1.2. Practices as a Unit of Design

What unites the approaches listed above is that they are all analytic; they take practices as a unit of analysis; understanding and gaining inspiration from what is. So far, however, there has been little research on what it means to take practices as a unit

of design; generating and evaluating what could (or should) be in the future. What would it mean, for example, to shift perceptions of grease in hair care, or to reframe technology consumption for everyday future practices? Therefore, in order to take the opportunities for systemic change further into designed artefacts (products, systems, services), exploration is required on what it means to take practices as a unit of design.

This exploration is relevant for sustainable HCI because it addresses the question of how to translate opportunities for systemic change into rich future visions that inform the design of (interactive) systems, while working with the complex social environments—our everyday lives—that they end up in and help shape.

Because this question is cross disciplinary, deals with preferred states, is future oriented, revolves around a wicked problem and aims to develop theory for design, it pre-eminently lends itself for a research through design approach [Zimmerman et al. 2010]. Such an approach leads both to new artefacts, in this case not a product but a “proto-practice,” and at the same time to ideas and knowledge about how to design.

By building on two existing examples of generative approaches that take practices as a unit of design and by introducing an empirical case, this article explores implications of practice theory in the generative, future oriented phases of design. To first deduce what it means theoretically to take practices as a unit of design, it starts by setting out guidelines that a practice-oriented design approach should adhere to. The empirical study is situated in the context of industrial design, however, the article contends and will elaborate that the methodology presented is equally applicable in the context of (sustainable) HCI design.

## 2. THEORETICAL GUIDELINES

As a first contribution of this article, literature in sociology and related fields is used to deduce guidelines or starting points for the “translation” of practice theory, which is descriptive in nature, to prescriptive, future oriented design methods.

First of all, it is important to stress that there is not one coherent practice theory, but rather a group of similar theories. Therefore, we speak of theories of practice, with main theorists such as Anthony Giddens [1984] and Pierre Bourdieu [1977]. Andreas Reckwitz [2002] has provided an overview of similarities and differences of work grouped as theories of practice. Theodore Schatzki et al. [2001] have brought together, criticized and enhanced these theories. Alan Warde [2005] has introduced theories of practice into consumer studies, resulting in a lively new field. Finally, sociologist Elizabeth Shove has facilitated introduction of theories of practice into the design discipline through a series of workshops and publications in 2005 and 2006 [Shove et al. 2007; Ingram et al. 2007]. Thinking about the implications of taking practices as a unit of design, the article draws on these sources, starting from Reckwitz’s widely used definition of a practice as

a routinized type of behaviour which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, ‘things’ and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge [Reckwitz 2002, p. 41].

### 2.1. A Constellation of Related Elements

A basic characteristic of practices is that they consist of constellations of interconnected elements. In his definition, Reckwitz provides a rather loose and nonexhaustive list, making it difficult to work with this nonetheless central concept. Other authors have grouped the elements in different ways (Gram-Hanssen [2011] provides an overview). The grouping used in this article distinguishes three types of elements: images, skills and stuff. This is in line with the terminology introduced by Shove and Pantzar [2005] and used in several design-oriented papers [Scott et al. 2011; Kuijer and De Jong 2012].

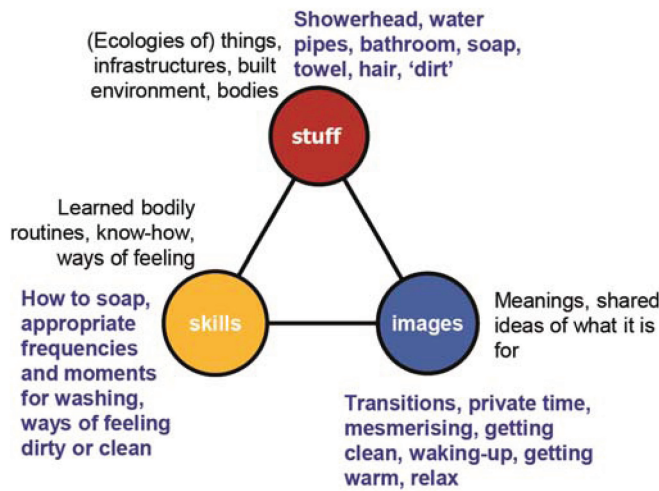


Fig. 1. Images, skills and stuff model illustrated with bathing example (adapted from Shove et al. [2012]).

Following Reckwitz and Schatzki, this interpretation involves the explicit inclusion of material elements and therefore clearly speaks to designers. An explanation of these three elements below is illustrated with examples from the practice of bathing and summarized in Figure 1.

Stuff refers to the material elements deployed in the practice. For bathing this is for example showerheads, taps, soaps, drains and bathrooms. In line with Latour [1993] no clear distinction between humans and things is made; together they can form a hybrid entity. For example, a person and a sponge, who can do more than either the sponge or the person alone. Moreover, as Hielscher et al. [2008] nicely illustrate, “natural things” like skin, hair and grease play determinate roles in the practice of bathing.

Skills are learned bodily and mental routines, including know-how, levels of competence and ways of feeling and doing. Skills involved in bathing are for example knowing how to judge when hair needs washing, ways of setting the temperature just right, appreciation of smells of soap, and so on. Again, there is no clear distinction between humans and things. Skills are distributed, and can be redistributed between people and products through what Latour [1992] refers to as delegation. Skills also involve shared knowledge about what is good, normal, acceptable and appropriate, and what is not. For bathing this includes ideas of cleanliness and public appearance, conventions of normal bathing frequencies and shared ideas about acceptable levels of smell.

Images are socially shared ideas or concepts associated with the practice that give meaning to it; reasons to engage in it, and descriptions of what Shove et al. call ‘the social and symbolic significance of participation at any one moment’ [2012, p. 22], which they explicitly treat as an element of practice, not as something that stands outside of it as a motivating or driving force. For bathing, images involve getting clean, but also waking-up, getting warm, getting ready, winding down and having private time, including time to mesmerize and to relax.

Images, skills and stuff together make up practices. Taking practices as a unit of design then means to pay as much attention to novel skills and images, as to stuff. However, this is not all. From their study into the practice of Nordic walking, Shove and Pantzar conclude that,

new practices consist of new configurations of existing elements or of new elements in conjunction with those that already exist. From this point of view, innovations in practice are not simply determined by

the generation of new products, images or skills. What really matters is the way in which constituent elements fit together. [2005, P. 61]

In practice-oriented design, the unit of design expands from things to include images and skills, but not without consideration of how these fit together.

## 2.2. A Bodily Performance

To better understand the role of these elements and their links, the distinction Schatzki [1996, p. 89] makes between what Shove et al. [2007, p. 148] summarize as the practice-as-entity and the practice-as-performance is helpful. Practices-as-entity are configurations of elements that have a certain endurance over space and time. The practice-as-performance, in which these elements are integrated by people in specific situations, is slightly different each time. The practice-as-entity cannot exist without regular performance and it is through the integration of new elements and making new links in performance that the practice-as-entity changes over time.

Describing a practice-as-entity is necessarily a random indication and a simplification of something that is in fact highly varied in its manifestations and subject to continuous change. However, describing a practice-as-entity, as opposed to describing one single performance, is more generally recognizable and in a way enables capturing a larger number of situated performances. This does not mean that the practice-as-performance can be cast aside. Drawing on theories of practice, performance is central in the conceptualization of change in practices, and when speaking about performance, the human body receives particular attention.

In practice theory, the human body plays an explicit role. In the words of Reckwitz [2002] practices are “routinized bodily activities.” Or as Schatzki puts it [2001, p. 3]. “The skilled body commands attention in practice theory as the common meeting point of mind and activity and of individual activity and society.” This attention is required for two reasons. One, because without involving the body, an important realm of knowledge is neglected and two, because innovation in practice happens through active performance.

Through performance, the body becomes trained in a certain way, when knowledge about the practice becomes embodied in the practitioner. In other words, people(’s bodies/minds) are carriers of practices [Reckwitz 2002]. Practice theory recognizes that there are things our body knows, but that we cannot verbally express. In Giddens’ Theory of Structuration, this knowledge is present as practical consciousness:

practical consciousness consists of all the things actors know tacitly about how to ‘go on’ in the contexts of social life without being able to give them direct discursive expression [Giddens 1984, p. xxiii]

For example, we can all walk, but cannot exactly put into words how we do it. Without bodily performance as part of the design process, an important realm of knowledge would be left out of the equation.

Moreover, when generating novel constellations of elements, bodily performance is important for another reason. People are carriers of practices, but not passively. Practices-as-entity are maintained and reproduced through regular performance [Shove et al. 2007, p. 19], but through varieties in performance, they are also transformed. When taking practices as a unit of design, bodily performance (i.e., active integration) should take a central position, for

innovations in practice depend upon the *active integration* of elements, some new, some already well established, that together constitute what we might think of as innovations-in-waiting or proto-practices [Shove and Pantzar 2005, p. 48] (emphasis added)

A proto-practice, in which familiar and novel elements are integrated, emerges from active bodily performance. Such proto-practices could be the result of practice-oriented design activities. However, in practice theory there is never an end result, because practices constantly change. In fact, change is default.

### 2.3. Crises of Routine

When zooming in on practices-as-performance, it becomes clear that this is not a uniform or constant picture. The practice-as-entity forms a collection of elements and potential links that allow for a wide variety of performances. However, a performance can also integrate elements that are not part of the practice-as-entity or makes links that have not been made before. In such cases, routine performance is not possible and people will “adapt, improvise and experiment” [Warde 2005, p. 12].

These instances of adaptation, improvisation and experimentation in performance can be triggered by all kinds of smaller and larger changes in circumstances, such as for example the introduction of unfamiliar elements. Reckwitz describes such circumstances as “crises of routine” [2002, p. 255] in which the “breaking” and “shifting” of structures takes place. Through these particular types of “crisis” performances, the existing practice is reconfigured into novel variations that involve both new and existing elements, and new and existing links. To generate desirable reconfigurations of the practice, such crises of routine could be deliberately staged.

### 2.4. Variety of Performances

In itself however, an improvised performance does not change the practice-as-entity. Only if this variety on the practice is repeatedly performed by several practitioners (if it works and spreads), it can change from exceptional and improvisational to acceptable and normal, thereby reconfiguring the practice-as-entity.

Simply because each performance is different, a similar crisis will, through varied (improvised) performances result in a range of reconfigurations. In each performance, different elements are available and different links seem to make sense. Given the crisis, a common reconfiguration that works emerges from a variety of performances. Therefore, taking practices as a unit of design implies generating a wide variety of possible performances.

Summing up the previous, it can be concluded that taking practices as a unit of design means to generate reconfigurations of images, skills and stuff. To achieve this, an approach should involve bodily performances, create crises of routine and generate a variety of performances.

## 3. EARLIER EXPLORATIONS

Published examples in which practice theory is explicitly used in the generative phases of a design project are few, but the two that are there form valuable explorations to draw lessons from. One is the “Experiments in Practice” approach developed by Scott and colleagues, the other is the “Trigger-Products” approach developed by the authors. Both will be shortly described and reflected upon in the light of the guidelines introduced above.

### 3.1. Experiments in Practice

Scott et al. [2009] have developed a multifaceted approach in which theories of practice are integrated with principles of codesign. Focal generative element in the approach is Experiments in Practice, in which participants are challenged to conceive and perform practical experiments in the context of their own homes and daily lives. Goal of the experiments in their pilot study was to try and make the mundane activity of bathing “more effective or sustainable.” During the two-week study, participants were guided

by a workbook and interacted on a closed blog. They met twice, both at the start and the end of the two weeks.

The idea of experiments clearly involves bodily performance and thereby the integration of images, skills and stuff. Moreover, the task to experiment created crises of routine in which participants were challenged to explore and stretch the borders of normal practice, thereby creating novel configurations of elements. The combination of involving a group of participants, and the duration of two weeks resulted in a variety of performances.

However, as the authors already mention, coming up with alternative configurations is not easy; “it requires creativity, courage, and the ability to envision something entirely new” [Scott et al. 2011, p. 7]. The authors further observed that creativity in challenging normal practice was complicated by the “rigidity of existing bathroom structures.” As a consequence, most of the experiments largely stuck to the existing practice of daily showering, for example by reducing the use of cosmetics or shortening shower time.

### 3.2. Trigger-Products

The idea that new things can form leverage points or triggers for playing out more radically different configurations, guided the setup of the Trigger-Product study. In this study on thermal comfort, prior analysis pointed in the direction of person heating to complement space heating, thereby widening the variety of ways to achieve comfort. Earlier studies suggest that offering such variety can reduce dependency on mechanical heating and cooling and thus energy consumption in households [Kuijter and De Jong 2012].

Participants in 60 households were offered a simple, small heat source and asked “to try out the product and see how you can use it as a way to keep warm,” to “be creative with the product,” and to report on how they used and experienced it in the context of their own homes and daily lives. The trigger-product was not selected because it was in itself thought to be a “sustainable innovation” or a “solution” to achieve reduced energy consumption for indoor heating. Rather, the goal of the study was “to explore what types of uses would emerge and how these may fit in or conflict with existing practices,” and to trigger “a variety of bodily responses and the evaluative reflections they evoke.” Because person heating is currently not widely practiced in the Netherlands, the aim was to get a preview of how such practices might be composed and find a place in existing complexes of domestic practices.

From the study it became clear that quick and local heat could work in situations of passivity such as watching TV or reading a book. Conflicts arose when it turned out that such heat sources require more work and attention than the passive relation people are used to having with their indoor climate control. Also found were undesirable directions of development, such as taking the heat source outside, potentially leading to increased expectations of comfort outdoors.

Again, bodily performance and experimentation is asked from the participants, in which integration of existing and novel elements (the trigger-product, existing expectations of required work) took place. The exercise led to conflicts and misfits in daily practice, which represent crises of routine. The large number of participating households led to a wide variety of manifestations of person heating practices.

However, the authors concluded that “exploring how person heating may work in current household situations, with existing skills and images, might not be representative for the future situations that such a product may end up in and help shape.” In other words, the trigger-products were used in a context of existing skills and images, which were difficult to let go of in the setting of a normal domestic situation.

### 3.3. Core Elements and Limitations

Summing up, the approaches both entail recruited participants—“ordinary people”—coming up with and trying out different ways of going about very mundane daily things, such as in these cases bathing and staying warm, in their own homes. Both examples involve bodily performance, crises of routine and generate a variety of performances. However, they also reveal some limitations of this type of setup.

Although leading to valuable insights on potential alternative ways of bathing and staying warm, and product design opportunities and challenges associated with them, it became clear that participants tended to generate reconfigurations that largely stuck to existing (resource intensive) practices. A challenge is therefore to find a set-up that is able to break with the rigidity of existing structures in existing household situations and to find participants with the required creativity, courage, and ability to envision something strongly different.

## 4. GENERATIVE IMPROV PERFORMANCES

The empirical study presented here followed a research through design process and thereby addressed both empirical and methodological aims. The methodological aim was to incorporate the guidelines of taking practices as a unit of design into a generative study, thereby explicitly looking for ways to strongly reconfigure existing practices. The empirical aims were situated in an ongoing project on the topic of bathing—as a washing or soaking (as in water or steam) of all or part of the body [Merriam Webster 2012]—that had been running for several years.

### 4.1. The Bathing Studies

Water and energy use for bathing take up a large share of household direct resource consumption, and have grown sharply over the past decades. Statistics on water use for bathing from before 1970 are difficult to find, but from knowledge that proper body care in the 1950s meant daily washing of hands and face and a (shared) bath once a week [Dutch open air museum 2012; Overbeeke 2001], average weekly water use per person will not have exceeded 50 liters. By the 1970s, the separate bathroom with shower had become a more common occurrence in Dutch homes and the shower started to overtake the bath as a popular way of full body washing. Today, showers are standard in every home and showering has become the dominant means for full body washing.

The shift from the flannel wash and bath combination to showering went hand in hand with an increase in water consumption. In just sixty years, water use for bathing has increased from under 50 liters per person per week, to over 50 liters per day. The shower, with its convenience, played a part in increased frequencies of full body washing, which went from once a week in 1950, to 5–6 times per week in 2010. Also, with its continuous flow it contributed to an increase in consumption per bath: an average Dutch shower requires 67 liters [Foekema and Van Thiel 2011]. Closely related, Hand et al. [2005] explain, were society wide changes in perceptions of the body and the self. While, cleanliness has been a prerequisite for participation in normal social life since the late 19th century [Bushman and Bushman 1988], standards of cleanliness slowly increased over time. Moreover, showering, with its qualities of “invigoration, freshness and fitness” [Hand et al. 2005] closely reverberates late-modern ideas of “the body as a vehicle of pleasure and self-expression” [Featherstone 1991: 170 in Hand et al. 2005].

Taking notice of how technologies, ways of washing and standards of proper body care are closely related, to each other and to levels of water consumption, it is clear that bathing is subject to change. Combining these insights with studies into bathing in other cultures, where for example in India a bucket bath requires less than 20 liters [Matsushashi et al. 2009], it can be concluded that (close to) daily showering, with its



Table I. Relation between Elements of GIP and Guidelines for Taking Practices as a Unit of Design

	Involve bodily performance	Create crises of routine	Generate variety of performances
The stage	Space to move and things to act with	Remove essential element and introduce unfamiliar stuff in form of prototype	Underdetermined low-fidelity prototype, variety of props
The scene	Task to perform in detail from beginning to end	Challenge to act as normal in situation that isn't, restriction on the use flowing water	Unscripted scene, require improvisation
The players	Trained to use their body in creative ways	Skilled to improvise, say 'yes, and' instead of 'no, but' in face of a challenge	Variety of people in multiple performances, people skilled and motivated to act out of the ordinary

constant flow of warm water is not the only and possibly not the least resource intensive configuration.

Starting out with a general aim of exploring how practices of bathing could become less resource intensive, the objective has been refined during the project. Having analysed the practice of bathing as it is, the focus of the project shifted to questions of what less resource intensive forms of bathing might be in the future, that is, bathing as a unit of design. With this renewed focus, a concept was selected that was broadly defined as “a way of bathing that is based on contained rather than flowing water.” It was coined with the working name *splashing* [Kuijer and De Jong 2011].

The main empirical question became whether and how *splashing* could work as a less resource intensive reconfiguration of existing bathing practices in the Netherlands. This empirical question was divided up into three subquestions: (1) what could *splashing* be as a novel bathing practice: what are dimensions of variety in performances and what practice-as-entity emerges from them, (2) what could be potential future effects of a shift from showering to *splashing* on household resource consumption and beyond, and (3) what are requirements and insights that can inform further refinement of the concept of *splashing*.

The study involved a lab setting of a simulated bathroom with a rough prototype in which improvisation actors are asked to perform a fictive scene of their *splashing* “routine” in detail, followed by an interview. The rationale behind this set-up is explained in terms of the stage, the scene and the players, and is grounded in the theoretical guidelines. An overview of the relation between the set-up and the guidelines is offered in Table I.

#### 4.2. The Stage

To enable a bodily performance, some form of physical environment was required. For this study, the choice was made to take people out of their everyday context into a lab environment. This choice was based on the observation, in previous studies, that participants found it difficult to let go of existing routines (skills) and norms (images) in the fixed environment of their bathrooms and shower booths (stuff). A lab, like a stage, was expected to form a place where acting out of the ordinary is more normal than at home.

In the lab, a bathroom-like space of approximately nine square meters in size was equipped with different props like a bath carpet, a bathrobe, soaps, plastic ducks, towels and sponges (Figure 2). Instead of the familiar bathing fixtures (bath, sink, shower) there was a rough, low-fidelity prototype consisting of a 20-liter basin on an integrated stand, and a seat. The prototype was deliberately left open; there were for



Fig. 2. A selection of props available in the simulated bathroom and the rough prototype designed and made by Harish Karakat [2009].

example no buttons, taps or drains on it and was made of foam with uneven plaster and cardboard parts attached with sellotape (Figure 2).

Such a low-fidelity prototype in a lab environment however, was not suitable to be used with water. Next to raising practical issues, adding water would have required decisions on where to place a tap, faucets and drains and how to shape them, thus making the prototype more determined. Therefore, the choice was made to, in this stage of development, have a dry bathroom with only imaginary water. This allowed participants to participate wearing their normal clothes, something that greatly helped recruitment.

For capturing the performances, four cameras and a microphone were installed. The images were broadcasted live for the researcher, but out of sight of the performer in order to create a semi-private bathing situation.

### 4.3. The Scene

The physical environment provided an open, yet subtly steering stage for a bodily performance. To further create a setting from which novel links between stuff, skills and images could emerge, a fictive situation was created in the form of a rough scene outline. The instructions in the study mimicked the types of instructions routinely used in improvisation acting, in which Medler and Magerko [2010] distinguish functional constraints and content constraints. A summary of the instructions is as follows.

- Imagine this is your own bathroom and that splashing is your normal way of bathing with which you are satisfied.
- Perform a complete splashing session starting by entering the bathroom, at least washing your body and hair and leaving the bathroom after finishing.
- Pretend to be bathing and make a credible performance with eye for detail, paying special attention to the water, you can imagine the space to be comfortably warm.
- You can use all objects you see around you and if you want to use something that is not there, imagine it; the only thing you cannot use is a shower hose or shower head with continuously flowing water.

Removing the shower from the bathroom, effectively destabilizes the normal practice of showering resulting in a serious crises of routine. At the same time, the setting offers

some alternative elements in the form of the rough prototype, which is presented as part of a way of washing that works. By sketching a scene outline in which splashing is considered routine and accepted, the setting challenges participants to dig deep into their repertoires of images and skills to create, through performance, a reconfiguration that works and is strongly different from what is normal today.

After the performance, interviews were held with the participants while still in their role. It focused on eliciting the explanations that are used to position splashing as an acceptable form of bathing. The interview mimicked the type of casual conversation in which one person tells another about a new experience. This is based on Giddens's concept of establishing (in this case also generating) mutual knowledge and valid descriptions of social activity [Giddens 1984, p. 375].

#### 4.4. The Players

Future products can be simulated with prototypes, but how to simulate future practitioners? Because practices and with them society constantly change, future practitioners are carriers of practices that contain different things, knowledge, know-how, and ideas of what is good and normal. While being provided with a challenging situation, participants needed to have the skills required to make it work. For this study, the involvement of improvisation actors was sought, with the expectation that they are:

- trained to improvise and thus make situations work by coming up with creative ways of doing,
- used to working at and over the borders of what is considered normal and appropriate, because “actors free themselves from socially accepted frames of reference and assumptions of expected behavior” [Vera and Crossan 2004];
- used to imagining things that are not there, such as water.

Moreover, for this study specifically it is useful to work with people who are not hesitant to perform a private activity, like bathing in detail while being observed. Naturally, these participants were at the same time experienced practitioners in the practice of showering.

To make the distinction clear, the setup is not improvisation theatre. The study makes use of the specific skills of improv actors and uses the functional and content constraints typical in improvisation theatre, but there is no audience, no objective to entertain and no competition element.

Table I summarizes the rationale behind the setup in relation to the theoretical guidelines introduced earlier. For reasons of convenience, this set-up is further referred to as Generative Improv Performances or GIP.

#### 5. PERFORMING SPLASHING

Eventually, 17 participants took part in the study, nine of which were trained improvisation actors. There was an equal spread in men and women and a wide spread in ages, from under ten to just over fifty. Most participants were Dutch, but other cultural backgrounds were Mexico, Greece, and the Philippines. The data of the study consisted of video (of the performances), audio (of the interviews) and notes made by the researcher. Together, the 17 participants produced a total of 25 performances of splashing; most participants performed twice, either in a duo performance as requested by the researcher (3 cases involving 6 participants), or in a second individual performance on their own initiative (5 cases). All performances were videotaped. The videos had durations of 00:2:10 minutes to 00:19:46 minutes, summing up to a total of 4 hours. The audio summed up to a total of 2.5 hours. Both audio and video recordings were transcribed; the videos in terms of both the actions and utterances of the participants. Data was analyzed using qualitative data analysis software in which utterances and

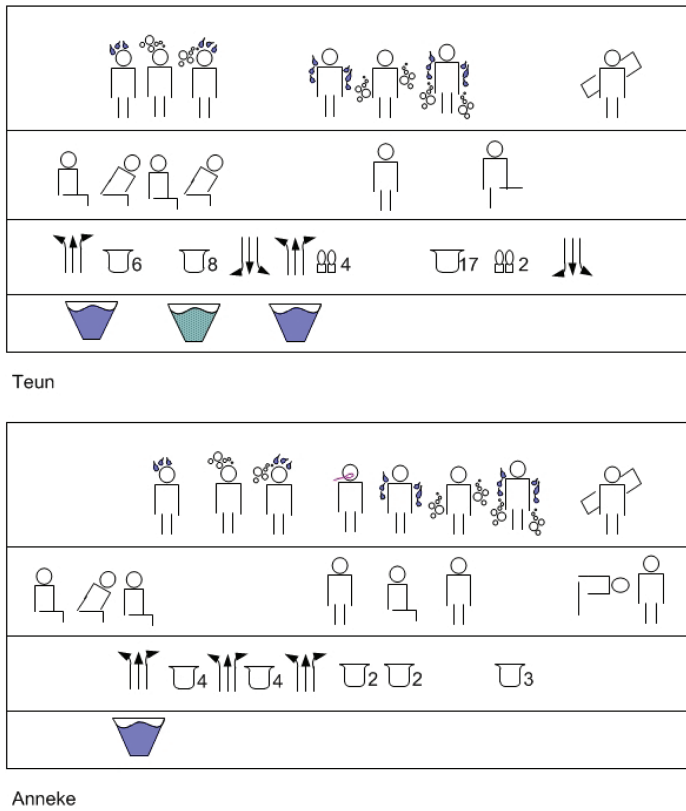


Fig. 3. Graphical overviews of the performances of Teun and Anneke. © Lenneke Kuijer.

actions were tagged and clustered. When names of participants are used, they are aliases.

### 5.1. Splashing as a Proto-Practice

The term showering comes with a relatively coherent set of collective, general knowledge, know-how, things and meanings connected to it. This is because showering exists as a fairly common practice. The term *splashing* does not have such collectively shared luggage. In order to evaluate potential future effects of splashing, on warm water consumption and beyond, and to inform further development of the concept, splashing needed to be fleshed out. Therefore, one of the aims of the study was to generate a rich narrative of splashing through a variety of performances, and to distil from these a preview of splashing as a relatively coherent reconfiguration of elements.

First of all, the 25 individual performances were analysed in detail and summarized in graphical overviews. These overviews use a pictogram library, which itself emerged from analysis of the performances (see Figure 3 and Figure 4).

Next, the different aspects of variety resulting from the set of performances were summarized (Table II). The table is not exhaustive, but rather gives an impression of the types and ranges of variety found. Dimensions of variety were sought in all elements of the practice and in the relations between them, with specific attention for warm water consumption. For example, “ways of wetting” mainly involve skills, “interactions” zooms in on the stuff in relation to skills, “likes” and “dislikes” surface

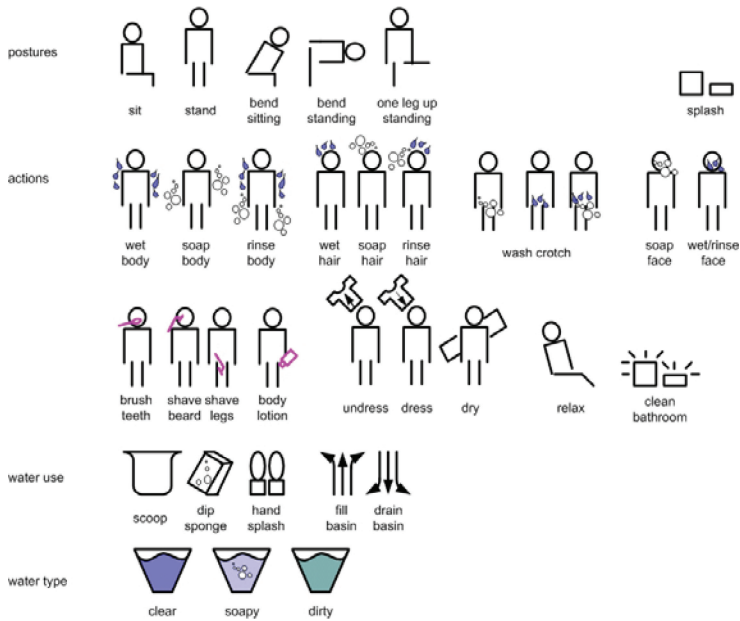


Fig. 4. Part of the pictogram library. © Lenneke Kuijter.

aspects related to image, and “durations” and “water use” give estimations of resource consumption.

From this variety of performances, a preview of the practice-as-entity emerges. Results of the study indicate that splashing could be an active, flexible way of washing the body, with water from a basin, involving sitting and standing postures, a range of ways of applying water and soap, involving scoops, sponges and hands, in varying sequences. Rather than rinsing with constantly flowing water, soap plays a central role in cleaning the body. Splashing can be quick and functional, washing selective parts of the body, but also a relaxing, time taking ritual with a focus on scent and deliberate body care.

Such a description may not mean that much to nonpractitioners. It is therefore insightful to mirror splashing with its direct benchmark, showering. In such a view, showering requires large amounts of water, can be tiring because you have to stand all the time making it difficult to wash your feet, is inflexible because you have to wet your entire body without being able to direct what is wet or rinsed when, and soap is rinsed off before you’ve had time to appreciate it. Water is splattering everywhere and there is a lot of steam so you cannot keep a towel or clothes nearby, and your bathroom gets humid. In other words, splashing repositions showering.

Having generated a preview of what splashing could be like beyond the abstract: “a way of washing that is based on contained water,” it is now possible to go into more detail on potential future effects of a shift from showering to splashing.

## 5.2. Potential Future Effects

When looking at the (virtual) amounts of water participants required for splashing, the study indicates that it can be considerably lower than showering. Important reason for this potential lies in the decoupling of water use from bathing duration; in splashing, taking time does not necessarily mean using more water. For example, to wash her hair and body, Anneke required a total of 4.5 liters (15 scoops of 300ml), taking around

Table II. Overview of Variety in Performances

Washing sequences	Head to feet, feet to head, from torso outwards, only upper body, start with hair, end with hair, intermediate dressing and drying, dressing and drying at end, soap hair rinse hair then start with body, soap hair soap body then rinse body and hair
Ways of wetting	Scoop and pour or splash with cup or bowl, soak and squeeze sponge or wash cloth, splash with hands, immerse body parts in basin (arm, foot, head)
Ways of soaping	Make soapy water in basin and rub with sponge (with or without separate wetting first), put soap on hand and rub on body, put soap on sponge and rub on body
Ways of rinsing	Scoop and pour, rub with washcloth then rinse and wring out, splash and rub with hands, with towel together with drying, immerse hand or foot in basin and splash with hands
Actions besides washing	Shaving, drinking, brushing teeth, listening to music, applying body lotion and make-up, playing, relaxing
Postures	Sit on seat, stand in front of basin, put foot on seat, put foot in basin, sit on basin, bend over basin, lean on basin
Durations	From 2 minutes to 19 minutes
Water use	From approximately 4 liters of actual water for washing to over 100 liters (several refills basin, flooded floor, tap and drain open continuously, water jets from basin and walls)
Interactions	Place things like sponges, soap bottle, washcloth, razor in or on edge basin and seat, have tap above basin, on edge basin, integrated in sides or bottom basin, on wall, on seat, with digital display, with turn knobs, with foot pedal, by rubbing side basin, have mirror above basin
Likes	Saves water, it's quick, you can take your time, it's relaxing, it is comfortable, it is deliberate, enjoy the feeling, it stimulates the senses, it is flexible, it is cosy, it is fun, it is compact, it creates little moist
Dislikes	Do not feel satisfactorily clean, makes a water mess, it is slow, it is not relaxing, it is boring, awkward to sit naked, miss the flowing water

10 minutes and Maartje used about 50 liters in 19 minutes. In comparison, a 19 minute shower, even with a water saving showerhead, would take 141 liters of warm water. However, this does not mean that splashing cannot be quick. Marcel used as little as 4 liters in 4 and a half minutes, and Magnus needed just 2 minutes for a quick wash, using approximately 10 liters.

It has to be mentioned that these amounts are estimations made on the basis of performances that did not include actual water, nor the experience of wet nakedness and vulnerability to cold that come with it. The exact numbers therefore mean little. What matters is their order of magnitude in relation to the bathing strategies they entailed. In addition to the inherent reliance on contained water, such strategies for example included combining wetting and soaping by making soapy water in the basin, and washing the body in stages (e.g. washing the hair while wearing a bathrobe).

As in the Trigger-Product study, potential negative effects of a shift from showering to splashing emerged as well. For example, a shift of focus to soap and a link between soaps and pleasure could pose future challenges. It is not clear at this point whether splashing would require more or less soap than showering—soap is rinsed away less, but becomes more central to the practice—but the use of more soap would mean a negative effect for the environment in terms of water pollution and resource consumption. It also raises questions about how splashing would work for people with sensitive skin or those

currently not using soap for bathing. Furthermore, splashing, being so flexible, might increase bathing frequencies, having for example a quick session in the morning and a longer one in the evening.

It is clear that the potential effects of splashing differ in scale from earlier studies in HCI that have focused on resource consumption in bathing (e.g., Kappel and Grechenig [2009], Ravandi et al. [2009], Laschke et al. [2011]). These studies focus on motivating or persuading people to shorten their shower duration through feedback and persuasive technologies, such as a pattern of colorful dots or a cord with LED's. Not only is the order of magnitude of possible savings of a shift to splashing larger, the chances of enduring change might be higher. Different from a feedback device that can simply be removed or ignored, splashing, if it would spread, would be anchored in place by a different fabric of the bathroom, a different set of bodily expectations and related to an altered set of meanings.

Naturally, such a shift is more drastic than placing a timer in your shower, which are already in the market. Possibly however, these devices to motivate people to shower shorter could facilitate a shift to splashing. Because they problematize showering as a water intensive practice, the disjunction [Hand et al. 2005] that may arise between the spread of power showers and images of wellness in the bathroom on the one hand [ISH 2011], and ideas of 'long' showering as problematic on the other, may lead to opportunities that splashing could take advantage of.

Although the current study has given some insight into potential future effects of splashing, all of the points above are in need of further study, the starting point of which will be a redesign of splashing.

### 5.3. Refining Splashing

The third empirical objective of the study was to generate recommendations for further iterations of the splash concept. With practices as the unit of design, skills and images become part of what is "designed." This is different from approaches where products are designed to fulfil what are taken to be static needs, as in common user research [Shove et al. 2007] or match existing skills as in most forms of user-centered design [Scott et al. 2009]. Instead of trying to "solve" possible dislikes and "usability problems" with technology, these issues are critically deconstructed, while skills and images are acknowledged as subject to change.

That some participants found splashing slow, not relaxing or boring, where others find it quick, relaxing or fun does not mean that splashing is these things. Rather, this shows that all these different links were made through the performances and thus that their potential is there in the current design. Further development means channeling the development of these links in beneficial directions. For example, the deliberate way of washing the body that is part of splashing was considered as a challenge,

In showering I had the feeling that everything you forgot would at some point be rinsed off, also soap residues and possibly a spot you had not reached would become wet anyway and in splashing you have to rather explicitly think about all parts of your body. So in that sense you need to be more attentive. (Ralf)

or quality by different participants.

you have to start up more calmly (than when taking a shower) because you are going about things more consciously, like, it sounds maybe crazy, 'yes, now I will wash my legs' or something, but that's it, you have to be more relaxed, because if you do it quick and roughly you will not feel clean, but if you take the time to really scrub, well, on each limb then yes, nice, just peacefully start up, yes, that is a great advantage, yes, yes. (Maartje)

Making sure that all body parts are washed and rinsed properly can be viewed as something of a hassle inherent to splashing. Or, it can be something that is learned as

a matter of course if deliberately addressing all different parts of the body is positioned as a way to relax.

Another option of dealing with dislikes is allowing for variety. The issues some participants had with sitting down naked are not a major problem if splashing allows both sitting and standing postures. Moreover, because some participants did not mind sitting, and sitting naked is done routinely in other cultures and (home) sauna's, it clearly seems like a bodily skill that people can learn. It might very well be that this issue will disappear spontaneously over time.

The issue of missing flowing water is a more tricky one that touches the core of the concept. In spite of the explicit instruction not to use a shower with continuously flowing water, participants found ways to incorporate flowing water in their routine, for example by having a tap above the basin that they left open to rinse their hair, up to several jets that were oozing water from the edges of the basin into the bathroom. However, from the observation that most of the participants, 14 out of 17, did not explicitly mention missing flowing water, it seems that splashing can offer qualities that can make up for this absence. Further study and development of the concept has to show whether this is indeed the case.

Besides rendering insights on skills and images, the study also resulted in adjustment of the brief for the stuff of splashing. For example, in terms of water use per splash it became clear that 20 liters is too large for the basin. The estimations of water use offered above have been made by summing up amounts of water applied to the body through scooping, sponging or splashing with hands. When looking at the water actually used in the process, this is quite a bit more. Reason for this difference is that while most of the time filling the basin fully, participants used much less than the 20 liters content before they drained again. For example, for washing his hair, Teun used a total of fourteen 300ml scoops of water. He then drained and refilled the basin to wash his body, using 17 scoops and drained again. While drawing off 40 liters, he actually used 9.3 liters of (virtual) water to wash. Moreover, the time the participants estimated for the basin to fill was much lower than the about 2 minutes it would realistically take. This observation, combined with remarks that quickly filling basin is part of their imagined ritual, supports the conclusion that the basin should be made smaller.

A second design requirement that emerged was to explicitly position splashing in a wet space. This could address the dislikes of not feeling clean and creating a water mess at the same time. Feeling satisfactorily clean was hampered by different reasons. One of these was the struggle participants had with managing clear and non-clear water. This management was made more difficult because a number of them felt hesitant to let the floor get wet, because it would make a "water mess". They therefore got soap and water rinsed from their body back in the basin, mixing it with clear water. Designing the space around the basin and seat explicitly as a wet space will make it easier to keep the water in the basin clean.

Finally, an issue that seems to be crucial for splashing to work or not as a less resource intensive alternative to showering is the issue of getting cold. Even though participants were fully dressed, did not use actual water and were in fact instructed not to feel cold, some of them still complained about feeling cold during splashing. In showering, the body stays warm thanks to a constant supply of warm water, something that exactly lacks in splashing. Whether participants would have indeed felt cold had their performances included water and nakedness is something that cannot be known from the current set-up. There is however, strong reason to expect that getting cold could be a major issue. Therefore, one of the requirements for the redesign is to include some form of heating.





Fig. 5. Design and images by Linus Knupfer for LivingGreen.org [Knupfer 2011]. Images with permission of Linus Knupfer.

#### 5.4. The Refined Design and Next Steps

Based on the results of the study, a redesign was made of the ‘stuff for splashing’, by a designer who participated in the study and was elaborately briefed on the outcomes. In addition, he did experiments in his own bathroom to try out for example different sizes for the basin.

The resulting design is shown in Figure 5. As can be seen, it is clearly different from the previous design shown in Figure 2. The basin is reduced to approximately 2 liters, a handheld push-button shower is added and the fixture is designed for easy instalment in existing shower cubicles. A local and quick heat source is added in the cubicle.

Besides the physical design, the redesign iteration also resulted in a set of instructions and new terminology to explain possible ways of splashing to novices, including particular ways of positioning splashing relative to showering. Initial prototype tests with ten participants—this time with water—showed both positive responses to the washing experience and, without explicit mention of the water saving objective, an average water use of 20 liters. The water savings and with that the energy saved to heat the water, more than make up for the energy required for the heater [Knupfer 2011].

Referring back to Hand et al. [2005], what also becomes clear from analysing the historic career of bathing, is that how change happens is not a matter of new technological possibilities alone. The shower existed long before showering became popular. Moreover, bathing does not exist in isolation, it is part of a field of interconnected practices [Schatzki 2001]. Ideas of cleanliness or perceptions of the body for example, are not elements of bathing alone. Reconfiguration of bathing may require reconfiguration of a wide range of related practices. Using the new prototype, next studies will therefore involve long term testing in real life environments to gain insight into the interaction of splashing with other domestic practices, such as sleeping, working, having breakfast and laundering.

#### 6. REFLECTIONS ON THE APPROACH

While the empirical aim of the study was to generate a practice prototype of splashing and to inform further design iterations, the methodological aim was to explore how the implications of taking practices as a unit of design could be integrated into a generative method. The proposed Generative Improv Performances (GIP) approach provides a

possible answer to this question. The following section will reflect on the strengths and limitations of GIP in relation to existing prototyping approaches in (sustainable) HCI.

### 6.1. Isolating the Practice

A particular strength of GIP is its ability to generate rich narratives of possible futures that strongly deviate from the currently normal. While there is value in taking prototypes to the field and doing performances in context, as promoted by several authors (e.g., Odom et al. [2012], Foverskov and Binder [2009], Iacucci et al. [2002]), this article argues that the lab environment has certain advantages over the field. As opposed to studies conducted in the context of people's own homes, the lab set-up created a not-so-everyday crisis of routine in which the "breaking" and "shifting" of structures is deliberately triggered. By making not so readily available the familiar resources used in the recreation of day-to-day conduct and by suggesting particular alternatives, the set-up facilitated the integration of familiar and unfamiliar elements into novel configurations of the practice.

However, this isolation of practices from their everyday context can also be seen as a weakness of the approach. Besides missing potentially important links with other everyday practices, GIP can only be applied to practices that can be isolated in such a way. This excludes for example the study of the Local Energy Indicator by Pierce and Paulos [2012], or communal energy management [Boucher et al. 2012], which involve a range of practices that are dispersed in time and over the home. Addressing this limitation, a possible avenue of further research may be the use of GIP in a Living Lab setting [Bakker et al. 2010], where the lab comprises an entire dwelling and performances span several days or more.

Another form of isolation in this setup is isolation of participants from each other. This was more of a practical than methodological choice, since it would have been nearly impossible to get all participants together at the same time. Isolating participants is contrary to the idea of practices as collective achievements in which interaction between practitioners is crucial [Schatzki 2001]. An ideal set-up may have been more like the Situative and Participative Enactment of Scenarios method [Iacucci et al. 2002], where participants perform in front of each other. However, this idea of building on others may reduce the level of variety that is reached with the current set-up. Whether and how GIP could include participant interaction is another topic of further study.

### 6.2. Improv Actors

Seemingly unique about the approach is the involvement of trained improvisation actors. Although other types of participants can be involved, GIP assumes that improvisation acting, and importantly the ability to act outside of the currently normal, is a skill that takes time and practice to learn. The thought provoking idea of re-thinking co-design as social drama, introduced by Foverskov and Binder [2010], shows many similarities to the ideas behind GIP. Their observation that the actors, who were not trained actors before being involved in the project, needed preparation lasting several hours spread over several days before they could make a credible performance, confirms the idea that improv acting is a skill requiring training.

Besides saving preparation time, the use of skilled improv actors also seems to shift when and by whom the 'designing' is done. In the User Enactments method for example, designers first make a detailed script or scenario, which users are then asked to enact [Odom et al. 2012]. In the case analysed by Foverskov and Binder [2010] the process of making the scenario was more participatory, but most of the designing had taken place before the scenario was played out. When using skilled improv actors, the actual performance can become the heart of where designing happens, making the participants the main designers.

This approach is basically different from evaluative prototyping studies in which emphasis is placed on evaluation, addressing the main question of whether something works. In GIP, the main question is how something might work. GIP forms a starting point for further research and debate on how decisions on “desirable” change are made, should be made and by whom; a discussion that has been addressed in a similar way in the related field of backcasting and planning by Wangel [2012]. Rather than conceptualising future users as rational actors that can be persuaded to choose the “right” behavior, as determined by the designer, and using prototyping to evaluate whether this behavior and expected savings are achieved, GIP involves practitioners in generating reconfigurations that may not seem logical or rational to the designer, but that make sense to them.

Another function of prototypes common in HCI is using them as probes [Gaver et al. 1999; Hutchinson et al. 2003; Routarinne 2007]. Such probes are set out in the field for various durations of time to generate discursive, inspirational responses from participants. Although generative rather than evaluative in nature, probes differ from GIP in two main ways. One, because GIP is mainly interested in (detailed) bodily performances. When focusing on discursive responses, findings tend to comprise things participants think they might do. However, this can differ strongly from what they would actually do, simply because in performance of the unfamiliar, unexpected practicalities are bound to arise. Something that repeatedly happened in the splash performances. Two, because GIP actively facilitates reconfiguration of practices beyond the usual suspects. Like observed in the Experiments in Practice and Trigger-Product studies, situating a study in the context of normal daily life limits the level of change that is seen as feasible. Although challenged to integrate novel elements (the probe), when people are not actively facilitated to reconfigure practices, they tend to draw from a readily available set of skills and images. GIP was developed to overcome initial resistance to change by actively challenging participants to make something that may seem unacceptable at first sight (“You want me to wash from a bucket?”), work through skilled improvisation.

Surely the choice for improv actors also has limitations. Bathing is a practice in which everyone is expert, but there are examples where target audiences are more specific. For example, someone improvising the role of a parent while not having children themselves, or the role of a plumber while not being familiar with the actual practices of plumbers. Although not being familiar with existing conventions may be an advantage when aiming for novel configurations, a major limitation will be that the actors will not have the appropriate library of (potential) skills to draw on and therefore may lack the ability to generate reconfigurations that make sense beyond the specific situation of the performance. Further study into the practices of improv acting could indicate whether particular improv skills could be conveyed to a wider group of potential GIP participants.

## 7. CONCLUSIONS

By deducing guidelines from sociological theories of practice, this article has argued that taking practices as a unit of design means to generate reconfigurations of images, skills and stuff and their links, and requires the inclusion of bodily performance, the creation of crises of routine and a variety of performances. The proposed Generative Improv Performances (GIP) approach integrates these guidelines, entailing a stage in the form of a lab environment with rough prototypes, a scene directed by a set of loose constraints, and improvisation actors as players.

In an empirical case study on bathing, GIP has shown to be capable of generating reconfigurations of elements at a level that resonates with the scale of change that can be observed from tracing practices back in time. Initial resistance to radical change

that is grounded in existing material and social structures can be overcome by involving participants particularly skilled at making challenging situations work through improvisation.

By making bodily performance central to the approach, the locus of design activity is shifted from professional designers to participants. Moreover, by performing in detail, the gap is bridged between what people think they might do and what actually works in an unfamiliar situation—a gap arguably even larger than the widely recognized gap between what people say they do and what they actually do in everyday routine.

The resulting range of performances flesh out opportunities for change that encompass but go beyond technological and behavioral change, showing potential for large and enduring reductions in household resource consumption.

Although the empirical study did not entail an interactive system in its common definition, examples offered in the article indicate that the approach is equally applicable in the area of sustainable HCI and the discussion has revealed several avenues for further research.

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