

# 9 Conclusions

## 9.1 Introduction

The aim of this research has been to explore the implications of a practice theoretic orientation for sustainable design. At the start of the thesis, sustainable design has been narrowed down to the particular area of design research that is concerned with high and rising levels of resource consumption in households. Based on an overview of current approaches in this area of sustainable design and their limitations in Chapter 2, the main question has been specified to the implications of making a shift from interactions to practices as the unit of analysis and design. To address the main questions, a research through design approach was used, involving projects on the topics of bathing and staying warm at home. Based on the theoretical framework offered by theories of practice set out in Chapter 3, earlier work on practice-oriented design reviewed in Chapter 4, and insights gained from the empirical projects, a twofold practice-oriented design approach is presented in the Chapters 5 and 6. This approach forms the core result of the thesis. The empirical projects that form both the basis for and illustration of this approach are described in Chapter 7 and 8.

Having answered all sub-questions posed in Chapter 1 through the course of this thesis, the current, final chapter presents the general conclusions of the research by addressing the main research question. In addition, it will go deeper into additional contributions made by the thesis. These conclusions are followed by a discussion in which limitations of the results in the light of choices made and approaches taken are addressed. Finally, the chapter closes with an overview of avenues for future research.

## 9.2 General conclusions

The main research question addressed in this thesis was whether drawing on theories of practice could lead to design approaches that are more effective in addressing the issue of high and rising levels of household resource consumption than existing approaches. The answer to this question can be split into two parts. The first part is the question of whether drawing on theories of practice can lead to design approaches at all. The second part is whether these approaches can be more effective than existing approaches in addressing the issue of high and rising levels of household resource consumption. The sections below will first answer the 'approach' question affirmatively by briefly summarizing the practice-oriented approach to sustainable design proposed in this thesis. Subsequently, in Section 9.2.2 the question whether this approach can be more effective than existing, interaction-oriented approaches is addressed in terms of its added value for sustainable design.

### 9.2.1 A practice-oriented approach to sustainable design

Core to this thesis is the proposed practice-oriented design approach. The aim of the approach is identifying and refining opportunities for deliberate intervention that can achieve or facilitate change towards practices that have lower levels of resource consumption involved in their performance. The proposed approach, represented in Figure 9-1, works from a selected target practice, via analytic and generative steps towards a less resource intensive reconfiguration of this practice that has potential to work.

Selection of the target practice is dependent on the context of the design project, and its framing can change during the project. A practice that works is found to be repeatable after performance and has shown to be able to spread by recruiting new practitioners. It is considered desirable when its performance requires much lower levels of resource consumption than the current practice.

Below, the approach is briefly summarized. It is described from the perspective of the designer, but where it says designer this can also mean a multidisciplinary team of designers and researchers.

The analytic phase, in which practices are taken as a unit of analysis, works from a selected target practice to opportunities for intervention. The model recommends four related forms of analysis:

- **Quantifying consumption indicators:** in this step, the designer collects data on current average levels of resource consumption involved in performance of the target practice, variety on this average both within the target practice and in similar practices outside of this framing and data on the historic development of levels of resource consumption. Based on this data, and when available, studies into basic needs the designer selects a target level of reduced consumption.

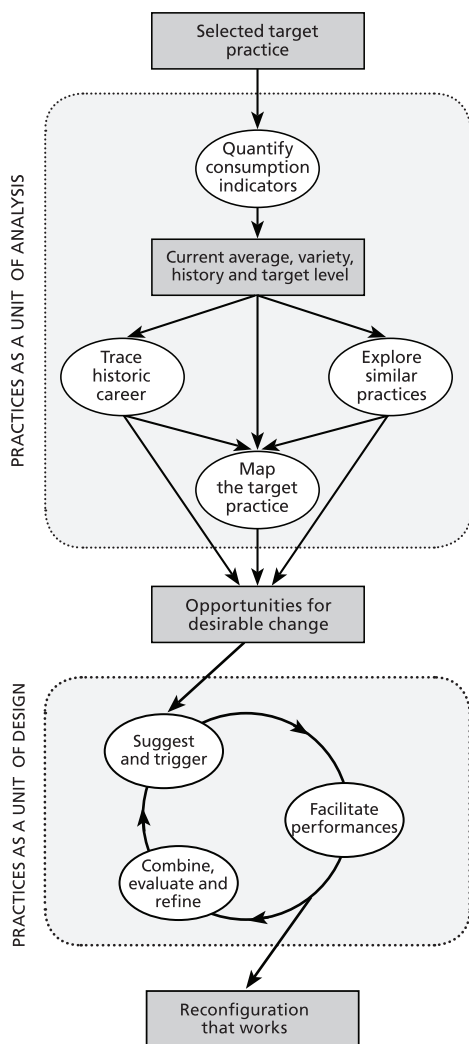


Figure 9-1 Proposed practice-oriented approach.

phase. Analysis of its historic career and similar practices is expected to help the designer create a critical distance. Results of the analysis are priorities for change, particularly stable characteristics of the practice and tensions in its configuration.

From these different overviews, opportunities for intervention and desirable change can be identified by combining target levels of resource consumption with elements from desirable (historic and contemporary) configurations and tensions in the target practice. The opportunities for intervention thus identified form the starting point for the generative

- **Tracing historic career:** in this step, the designer gains knowledge about the historic career of the target practice. Depending on the practice and on developments in its resource consumption identified in the previous step, it is recommended to go back at least a century or more and to use both narrative and visual representation to gain an overview. Result of this activity is insight in the stability and dynamics of the target practice and in lower resource intensive configurations of it.
- **Exploring similar practices:** in this step, the designer explores similar practices that fall outside of the framing of the target practice and have been identified as strongly lower in resource intensity. Such practices can be found in other cultures, but can also exist closer to home depending on the way the target practice is framed. Again, result of this activity is twofold, consisting of the creation of points of reference to highlight the target practice, and insight into desirable configurations that work.
- **Mapping the target practice:** in this step, the designer aims to get an overview of the target practice, with a specific focus on the relation between the constitution of the practice in terms of images, skills and stuff and its level of resource consumption. Because the designer is generally a carrier of the target practice, this step is the most challenging one of the analytic

phase of the approach, in which practices are taken as the unit of design. This phase consists of several cycles of iterative refinement of the desirable reconfiguration. Central in the cycle are performances of the proto-practice by carriers of the target practice:

- **Suggest and trigger:** in this step, the designer prepares the proto-practice for performance. A proto-practice contains stuff (not necessarily new), skills and images, and can include novel vocabulary and suggestions on what to feel. Depending on the goals of the cycle, the designer can compose a mix of low-fidelity and high-fidelity representations of the proto-practice, and open and more specific instructions. Further triggering improvisation and experimentation can for example be done by removing elements or links from the current practice, situating performances out of everyday settings and involving people particularly skilled at improvising
- **Facilitate performances:** goal of this step is to generate a variety of reconfigurations that (have potential to) work through bodily performances of the proto-practice. Task of the designer is to recruit a variety of participants and to facilitate the possibility of repeated performances. Depending on the goals of the cycle, emphasis can be more on variety or on repetition. Important for the next step is to document performances in terms of elements, links, sequences of actions, practitioner's rationales and evaluations, and levels of resource consumption.
- **Combine, evaluate and refine:** in this step, the designer combines data of separate performances into an overview of dimensions of variety and a coherent narrative of the proto-practice(-as-entity), evaluates whether the proto-practice works or has potential to work and how and whether it has desired levels of resource consumption, and refines the proto-practice. Result of these refinements is a reconfiguration of the target practice that is expected to work and have the desired level of resource consumption and is ready to be fed back into another cycle of performances.

Eventually, the suggested reconfiguration should become ready to move from the protective environment of the incubator community that is facilitated by the designer to start leading a life of its own. It has to be noted though that because the practice continuously changes, continued monitoring of the target practice and involvement in the form of additional interventions is part of the process of practice-oriented design, which never ends.

## 9.2.2 Added value for sustainable design

Based on the work presented in this thesis, it can be argued that the proposed practice-oriented approach to sustainable design can be more effective in addressing issues of unsustainable levels of household resource consumption than existing interaction-oriented approaches. Briefly recalling Chapter 2, the main limitations of interaction-oriented approaches can be summarized into two main points, one being a focus on tinkering with the status quo while missing opportunities for larger scales of change, and second a risk of not achieving intended change, or even opposite effects with designed interventions. The following section will explain how the practice-oriented approach proposed here addresses these limitations. It will do so by highlighting four distinguishing characteristics of practice-oriented sustainable design, which are:

1. Explicit attention for history and diversity in analysis of the target practice
2. A focus on improvisation and experimentation
3. Treating bodily performances as the locus of design activity
4. Striving for an open design

The first two characteristics contribute to a larger scale of change, and the second two to a higher chance of achieving the desired change. For each characteristic, the section below will explain how it follows from a practice-orientation and how it contributes to the effectiveness of sustainable design. After an additional note on the potential of practice-oriented approaches to achieve large-scale reductions in resource consumption, the section will close with a brief reflection on two other limitations of interaction-oriented approaches highlighted in Chapter 2, which were a strong normative rhetoric and placing responsibility for desired change with single individuals.

1. Explicit attention for history and diversity in analysis of the target practice  
Analytic activities in the practice-oriented approach explicitly involve attention to the historic career of the target practice and to diversity in its manifestations, both within and outside of the selected framing. Interaction-oriented approaches on the other hand, tend to focus on situated product-user interactions, and on average levels of consumption and ways of use. In terms of theoretical origins, the attention to history and diversity in practice-oriented design can be traced back to the idea of a practice-as-entity that exists over space and time as a recognizable, yet changing and diverse entity.

Attention to history and diversity supports an orientation towards larger scales of change in two main ways. First, it helps the designer reveal the status quo by contrasting the target practice to alternatives that have existed in the past or currently exist elsewhere. For example, analysis of practices of staying warm at home revealed a positioning of contemporary Dutch practices of staying warm at home on the space heating side of a person-heating-to-space-heating continuum. Second, by highlighting the temporality and relativity of the status quo, these forms of analysis create room for the possibility of extensive change, especially because currently existing norms, standards and needs are viewed as part of the practice and thus as varied and subject to change. For example, instead of assuming (daily) showering as a non-negotiable need, which it may seem to

be when studying the target practice alone, showering is revealed as a relatively recent and local form of bathing. Having opened the possibility for extensive change, it becomes possible to set and work towards ambitious targets for reductions of consumption levels.

## 2. A focus on improvisation and experimentation

Another characteristic of practice-oriented design that contributes to achieving a larger scale of change is the focus on improvisation and experimentation. It is in these particular dispersed practices that people step away from the status quo. Integral to practices of improvisation and experimentation is a justification of acting outside of the normal and of deferring judgment. Therefore, in improvisational or experimental performances, focus is on *how* alternatives could work instead of *whether* they work. This creates space for developing strongly different alternatives that may seem unacceptable at first sight. In the bathing projects for example, washing from a bucket might not seem acceptable at first, but it was developed into a proto-practice that is acceptable for at least a number of people and shows potential to become so for more. Because some practices can be relatively inert and resistant to change, practice-oriented design creates situations particularly receptive for improvisation and experimentation, thus facilitating change of instead of *within* the status quo. In interaction-oriented approaches on the contrary, the designer strives to make the intervention as 'smooth' as possible to make it 'fit' into existing configurations.

## 3. Treating performances as the locus of design activity

Practice-oriented design treats bodily performances as the locus of design activity, while the initiating designer takes the role of facilitator and catalyser. This shift of design activity to settings of daily life acknowledges that an intervention in daily life requires redesign of existing configurations that work; i.e., of the existing practice and web of practice it is part of. In terms of practice theory, this shift towards performances reflects ideas about the recursive relation between entity and performance, ideas of practices as bodily/mental routines and the idea of change as emergent. This position is basically different from the idea in interaction-oriented approaches of behaviour being predictable on the basis of causal model, which are used to make decisions about the product and thus inherently about the way it should be used and interpreted. By incorporating bodily performance in the design process and viewing interventions as starting points rather than results of design processes, practice-oriented design leads to a deeper understanding of the complex implications of an intervention on daily life. It thus allows for exploitation of desirable and partial anticipation of undesirable effects leading to a higher chance of success in achieving the desired change in practice.

## 4. Striving for an open design

A practice-oriented approach strives for a form of open design in which variety and change over time are facilitated by keeping open possibilities for alternative interpretations. This idea of open design directly relates to the concept of practices as changing over time and being internally differentiated. It can be contrasted to the pursuit of specific, 'good' use scenarios and optimization that is prevalent in interaction-oriented approaches. By being appropriate for a range of different performances and having some resilience to

change over time, practice-oriented design has a higher chance of achieving desired change. Moreover, these ideas of open design give body to ideas existent in philosophy of technology in the sense that they counter what Borgmann (2000) refers to as paradigmatic consumption by enhancing human engagement with 'material reality'. Along the same lines, Verbeek (2005) speaks about 'engaging products', the design of which is to him about delegations of tasks and responsibilities from things to humans (as opposed to the more common form of delegation from people to things referred to by (Latour 1992). Looking at the splash and person heating concepts, they both involve this form of delegation as compared to current alternatives of showering and central heating in the sense that both require more engagement from people than their existing counterparts do.

### Larger scales of change and higher chances of success

Arguing that a practice-oriented approach is both able to achieve a larger scale of change *and* a higher chance of wide scale adoption is a bold statement that is not fully supported with evidence from the case studies, because the proto-practices could not be widely implemented within the scope of the research. Therefore, to substantiate the conclusion, a real world example is offered here that illustrates that extensive, environmentally desirable reconfiguration of everyday practices does not necessarily exclude fast and wide adoption.

This is the example of the Cool Biz campaign in Japan. About the campaign, NPR journalist Kesterbaum writes in 2007, 'two years ago, the Japanese government – essentially with the stroke of a pen – instituted a new policy that has so far trimmed more than two million tons of greenhouse gases from the country's growing emissions'. Although its introduction was quite sudden, there was more to the campaign than the stroke of a pen. Cool Biz was a well thought through and multifaceted campaign that, although not containing an explicit practice-theoretic outlook, can be viewed as the successful introduction of a radically disruptive proto-practice. The main aim of the campaign was to save energy on air conditioning in offices. It aimed high, literally, by suggesting a temperature for air conditioners of 28°C - which was for government buildings even mandatory. A setting of 28°C is not just a little higher than 'normal' temperatures (widely used models recommend temperatures between 20 and 23°C), but much higher. Yet, it succeeded, as will be argued here, because it was a well-crafted proto-practice.

Cool Biz, firstly, went beyond the idea of motivating people to change indoor temperatures. Anticipation on how a higher temperature in offices may work brought forward the importance of ways of dressing. This, and not the temperature settings, became the focus of the campaign. A proto-practice was developed involving reconfiguration of the images, skills and stuff of office fashion. Clothing designers were requested to develop 'cool' office attire, instruction sheets were made with suggestions of how to dress during summer and images of proper ways of dressing were challenged, while at the same time, new standards were promoted – importantly by government officials and captains of industry. Acting outside of the normal was further facilitated, for example with stickers saying 'Excuse my attire, I'm doing Cool Biz'. Once launched, the campaign set off a range of additional responses, such as the introduction of special Cool Biz haircuts, and the development of more Cool Biz fashion (Kesterbaum 2007). In offices, workers came up with creative ways to stay cool,

such as the use of electric or manual fans, taking laptops to cooler areas in the office and planning meetings in small conference rooms with adjustable air conditioning (Moffett 2007). And it worked. Air conditioners were turned up to higher temperatures in all government buildings. As a result, CO<sub>2</sub> emissions were reduced by half a million tons. In its second year, the number of companies and numbers of businessmen participating in the Cool Biz initiative expanded enormously (Kesterbaum 2007), and in 2007, the campaign had hit just about everywhere, 'with corporate offices, restaurants and even grocery stores ratcheting up the temperature' (Moffet 2007).

Even though Cool Biz is just one example, initiated from a policy rather than a product design perspective, it does show a successful case of catalysing the 'societal-level renegotiation of ideas about comfort and freshness' (Chappels 2010) and thereby achieving extensive reductions in resource consumption. Having said this, the two sections below will discuss the practice-oriented approach in the light of two other limitations of interaction-oriented approaches.

### Normative rhetoric and placing responsibility with individuals

Besides limitations in achieving the desirable scale of reductions on resource consumption, interaction-oriented approaches in sustainable design are also criticized for their strong normative rhetoric of 'right' and 'wrong' behaviours, and for placing the responsibility for reducing levels of household resource consumption with individuals. The practice-oriented approach presented in this thesis is also clearly normative in the sense that it considers current European levels of household resource consumption to be too high. However, it does not prescribe particular ways of behaving. The proto-practice emerges from performances instead of being imposed on people and is acknowledged as internally differentiated and subject to change over time. It therefore offers a loose canvas that is open to a variety of interpretations. Regarding the other point of critique, it can be concluded that the approach has so far not been developed to its potential. Although focus has shifted from individuals to practices, there is still quite some emphasis on what household members and industrial product designers can do to change. Superficially taken into account so far are the roles of other stakeholders in a practice, such as policy makers, architects and installation professionals. This is therefore an area for further research.

## 9.2.3 Additional contributions

In addition to contributions to the particular area of sustainable design outlined above, the thesis makes several other theoretic and practical contributions. They include involving design-oriented additions to practice theory, introducing practice theory to a design research audience, and proto-practices in two areas.

### Design-oriented additions to practice theory

Practice theory clearly provides a fresh view on core issues relevant to sustainable design. In this thesis, such insights were translated into a design approach. A side effect of this process of integrating a practice theoretic view into sustainable design has been insights gained from a *design-oriented view on practice theory*. Although minor and domain

specific, the thesis proposes several unique contributions to theories of practice. These are the proposed adjustment to the images-skills-stuff model as groupings of elements and multitudes of links (Figure 9-2), which helps to highlight the central relation between the practice-as-entity and the practice-as-performance. Secondly, the recursive character of this relation is further explained in another a visual, introduced in Chapter 6.

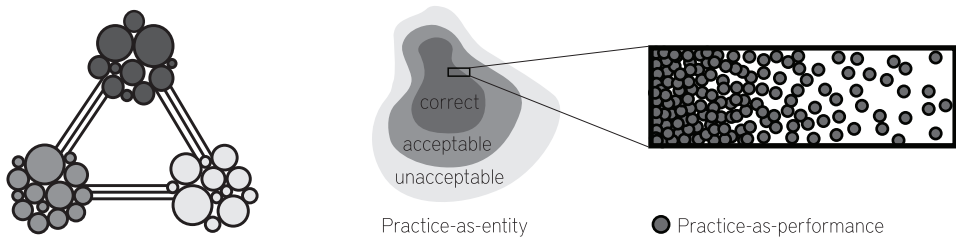


Figure 9-2 Contributions to practice theory in the form of visualisations.

Moreover, Chapter 6 develops the position of design in relation to practice theory, particularly by highlighting the importance of the dispersed practices of improvisation and experimentation for change beyond the current status quo. Such views (and the approaches that have followed from it) could be of particular interest to other areas of research that draw on practice theory and that aim for transitions towards less resource intensive ways of life, such as for example in the area of policy making. Several concrete activities in this area have been presentations of the work to non-design audiences such as at the Lancaster Sociology Summer Conference and the 4S/EASST conference. A proof of interest in these theoretic contributions has been an invitation to attend the Royal Geographers Society Annual International Conference as a guest of the Planning and Environment Research Group.

### Introducing practice theory to a design research audience

Although part of the theoretic explorations of this thesis, the design oriented interpretation of theories of practice offered in Chapter 3 forms a unique contribution to design theory. During the course of this PhD project, it has become clear that conveying practice theory to a design research audience is a great challenge. Practice theory is complex, it is ambiguous because of its variety of theorists, and, in many respects offers a view diametrical to mainstream (implicit) theoretical positions in design research.

The overview and interpretation of practice theory offered in this thesis has been developed over the course of four years through a series of encounters with design students and design researchers. First, there was of course its encounter with my own designerly orientation, which became particularly apparent during my stay at the Lancaster University Sociology Department. What I quickly came to realise was that this environment had a number of taboo terms that are perfectly normal in the design field. Examples are 'problem', 'solution', 'determine' and 'factor', which I gradually got used to replacing by more acceptable alternatives like 'issue' and 'intervention', or avoid altogether. At the same time, a number of new terms were added to my vocabulary, like 'nexus', 'co-evolution'

and 'transition'. It was only later, when I started to see the fundamentally different ways of approaching the world that they represented that I came to fully understand why these terms were taboo. This also made me realise that merely replacing 'problem' with 'issue' and 'behaviour' with 'practice' is not the same as adopting a practice-orientation. (It is a start though). Having experienced this process myself, the challenge became to facilitate it in other designers.

Over the course of the PhD research, ways of conveying practice theory to a design audience were developed over the course of many activities. Examples are peer-reviewed publications in design journals and conference proceedings, presentations and workshops at design conferences, informal conversations with colleagues, and the confrontation with over 150 design students through design and research projects in courses at the Faculty of Industrial Design in Delft. These encounters with students are summarized in Appendix C and will be further discussed in Section 9.2.

### Proto-practices in two areas

Besides more general (prescriptive) design theory, a research through design process also results in specific design outcomes. In this case, these concern proto-practices in the areas of bathing and staying warm at home, which were coined 'splashing' and 'person heating' respectively.

Splashing is a proto-practice that has shown potential to form a much less water and energy intensive alternative to showering that works for at least part of the people having performed it. Moreover, splashing in particular has developed into an entity with a life of its own. It is now for example considered to have a history, which is described in the specific section 'History of Splashing' in one of the master theses on the topic (Henny 2013). Splashing now travels independently of the author. In certain circles, mentioning the term 'splashing' has become sufficient to describe the entire concept without further explanation. In particular design research circles, such as the SusLabNWE project, it has even become an often used example. Although splashing is currently not regularly performed by anyone, as far as known, it has come to exist as a common understanding, among design researchers and beyond. Initiatives are taken, moreover, to develop it into a form of bathing, for example through implementation in a student housing project in Gothenburg, Sweden.

The idea of person heating as an addition to space heating has not been fleshed out as much as splashing and the resulting proto-practice shows at present less potential in rendering desired effects on household resource consumption. However, the opportunity of supplementing strong reductions in indoor base temperatures with person-oriented ways of staying warm is novel in the area of sustainable design. Moreover, the idea of person heating has been materialized into a series of product prototypes that are ready to be used for further development of the proto-practice. Finally, the idea of person heating as developed in this thesis has also travelled beyond the realm of the project in the form of scientific publications, student projects, participant involvement and popular press articles.

Having summarized the unique contributions of the research to several realms of knowledge, the next section will reflect on these contributions and the approaches taken to reach them.

## 9.3 Practice-oriented design and practices of sustainable design

This section discusses the limitations of the proposed practice-oriented approach in the light of its own recommendations. By viewing sustainable design as a set of practices and the proposed practice-oriented design approach as a desirable proto-practice for sustainable design, the process of developing the approach can be compared to the recommended practice-oriented design process. It is a theoretical exercise, because the approach could not possibly have been used to develop itself, but as will become clear below, it is an insightful one. Viewed in its own light, the process of development, and the proposed approach itself show some important limitations. The limitations thus highlighted form a basis for further research as outlined in Section 9.4.

While approaching sustainable design as a set of practices, this section follows the same structure used to discuss the practices of bathing and staying warm at home in Chapter 7 and 8, making a distinction between an analytic and a generative phase.

### 9.3.1 Analysing practices of sustainable design

In the proposed practice-oriented approach, analysis starts by framing a target practice and consists of four analytic steps, being quantifying consumption indicators, tracing historic career, exploring similar practices and mapping the target practice.

The target practice for the approach developed in this thesis has been practices of sustainable design. In Chapter 1, sustainable design is framed as design research aimed at reducing levels of resource consumption in households, which is further narrowed down to interaction-oriented approaches in Chapter 2. Quantifying consumption indicators does not apply in this case, but in Chapter 1, a challenging target of reductions of over 50% is set. The core analysis process, primarily presented in Chapters 2 to 4, did briefly trace sustainable design's historic career, explored similar, more desirable practices – notably practice-oriented design, in Chapter 4 – and researched the target practice of interaction-oriented sustainable design. However, from the perspective of the proposed practice-oriented approach, this process shows a number of limitations. First, and most importantly, approaches to sustainable design were not framed as practices in their own right. Consequently, neither form of analysis has described them in terms of images, skills and stuff and their relations. Moreover, analysis of the approaches has relied primarily on descriptions in literature. Although the researcher has had personal contact with carriers of both interaction-oriented and practice-oriented forms of sustainable design on many occasions throughout the projects, they were not formally interviewed as practitioners and encounters were not systematically analysed.

Another limitation of the analysis of practices of sustainable design can be found in the fact that in terms of similar practices, only practice-oriented forms of design were fully taken into account. Other, similar forms of design, such as for example critical design (e.g. Dunne and Raby 2001), design for social innovation (e.g. Manzini and Vezzoli 2003), ludic design (e.g. Gaver 2013), and participatory art (e.g. McHardy et al. 2010) were

not taken up as points of reference or inspiration. Neither were potentially inspirational examples from the policy arena, such as backcasting (e.g. Wangel 2011), ecological modernization (e.g. Spaargaren 2011), transition management (e.g. Kemp et al. 2007), and community-led innovation (e.g. Seyfang and Smith 2007). Possibly, because of this focus on practice-oriented design as a desirable alternative, the analysis of interaction-oriented approaches has fallen in the trap of judging the practice not from its own internal logic or sense making, but from the 'external' perspective of practice-oriented design. The thesis thereby problematizes aspects of interaction-oriented sustainable design that may not be viewed as problematic by its carriers. Being critical is not a problem in itself, but this lack of understanding of the view of current carriers on the target practice does limit insight in how the practice of sustainable design could be reconfigured.

### 9.3.2 Reconfiguring sustainable design

Adhering to the recommendations made for the generative phase of the practice-oriented design approach, the 'proto-practice' of practice-oriented design was developed through a number of cycles in which performances of design projects were central. In total, the proposed approach, or parts of it, featured in no less than 20 different design projects. They are summarized in Appendix A. However, of these 20 projects, only one project (listed 7<sup>th</sup> in the overview) was systematically set-up and analysed as a performance of practice-oriented design. Drawing on Scott et al. (2013), results of these evaluations will briefly be addressed below. Additionally, four of the nine master graduation students were formally interviewed after their practice-oriented design projects, as were representatives of the two companies involved. These interviews form the basis for further reflection on the generation of a proto-practice of practice-oriented design.

#### Performing practice-oriented design in a bachelor course

Practice-oriented design was implemented in one studio of a course taught in the second year of the bachelor's programme. This course was selected because it has a long history of systemic, critical interpretations of sustainability integrated into its objectives (Boks et al. 2006). Because of the course's large size and role as a core required course in the bachelor program, the teaching of practice-oriented design had to fit the established course structures, in which students work for external commercial clients and apply a future-oriented design approach using the Vision in (Product) Design technique (Hekkert and Van Dijk 2011). The client brief for the studio involved in the study involved looking for applications for a new beverage dispensing technology, with either a manual or battery-powered variant, in the food and beverage market.

To explain the practice-oriented approach, the researcher provided students with a printed assignment, a short presentation and supplementary supervision. The printed assignment included three components:

- A short explanation of key concepts from practice theory, including Shove's 'image, skills and stuff' model, change over time and variations between different (cultural) groups. These were illustrated through a design example: an alternative system for storing vegetables called Save Food From the Fridge (Ryou 2009).

- An explanation of the relationship between concepts from practice theory and the theoretical concepts central to the course.

A step-by-step assignment guideline, instructing students to analyse the current practice, explore its historic career and compare similar practices. The steps were illustrated with examples such as 'interview your parents or grandparents about how they stored vegetables 20 to 50 years ago'.

Overall, results indicate that the practice-oriented approach did not entirely work as intended in this situation. Students performed parts of the prescribed assignment, such as collecting information on breakfast in different cultures, describing breakfast through history, visiting professional restaurant kitchens and exploring the history of food preservation. However, these inquiries were typically superficial and students found it difficult to take a distance from the current status quo. This resulted in design briefs that tended to contain an un-critical, uniform and techno-centric view of practices. There were some examples of groups identifying opportunities for more systemic change. For example, an historic inquiry on food preservation led a group to conclude that in order to retain traditional techniques for nutrient-rich food preservation, the image of preserved products needs to change. However, this notion was not reflected in their final concept: an electrical sauce dispenser for professional kitchens.

Reflecting on these results, the lack of criticality and implementation of challenging opportunities can at least partly be ascribed to the technology oriented design brief, the demanding list of deliverables, and students' excitement about presenting to a company client in which they focused on selling their ideas. On this final point, Scott et al. (2013) reflect that partnerships between industry and education, while beneficial for institutional funding and career development for students, may hinder the application of critical thinking by students. Also observed was that students tend to default to normative concepts of value in everyday practices, like ease-of-use, which can get in the way of sustainability objectives. For example, while the technology students worked with had both manually-powered and battery-powered forms, nine out of ten groups choose the battery-powered variant. This choice was motivated by pursuits of 'ease of use', 'user friendliness', speed and 'efficiency'.

What this study indicates is that practice-oriented design seems to contain a number of characteristics that are not directly compatible with existing practices in design education. However, the current setting contained a number of constraints, perhaps most importantly the highly specific, techno-centric assignment that made performance of the recommended approach particularly difficult. The following section reflects on a number of performances in the less constrained setting of master thesis projects.

### Performing practice-oriented design in master thesis projects

Although not systematically analysed, implementation of the approach in several master thesis projects seems more successful in the sense that students gained depth and a critical attitude from their analysis of practices, and pursued directions that can be argued to be more radical in terms of desirable practice reconfigurations. For example, in the two food related thesis projects (5 and 12 in Appendix C) students analysed food practices largely in the way recommended in the practice-oriented design approach and identified

opportunities for change that required extensive reconfiguration. For example in the form of a shift from meat-based to vegetable based diets (Putman-Cramer 2011), or introducing more varied patterns of meat consumption by re-normalising the consumption of a wider variety of parts of animals (De Borja 2010). Additionally, quotes from interviews show how students have adopted practice-oriented dispositions towards design. For example, in the way in which Karakat (3 in Appendix C) viewed the practice of splashing as emerging from his project, in the importance he placed on detailed analysis of performances and in his view on the central role of water in bathing because 'it has been there for centuries'. Or Knupfer (13 in Appendix C), who has put great effort in making an open design, and expresses the importance of bodily performances as opposed to imagining, to judge whether a design works or not.

In spite of the large number of 'performances', however, the design projects were not explicitly and probably not to their potential used as the locus of designing the practice-oriented approach. Instead, the approach was rather unilaterally developed by the researcher. Possibly as a consequence, the approach is now presented as a particular way of handling a practice-oriented design project that could have been more open. It was not in the scope of this project to do a full analysis of this missed potential, but a birds-eye view reveals for example dimensions of variety in performances that were not incorporated in the proposed approach. Karakat used various ways to visually represent the proto-practices he selected in an early stage through mood boards and poses the idea of involving a small group of 'users' throughout the project, and Knupfer did a number of experiments with forms of splashing in his own home, placing emphasis on himself as a carrier of the practice. A quick scan of the interviews also reveals challenges encountered by the students that could have been addressed more fully to make the proto-practice work. For example, Karakat found a great challenge in documenting performances of his splash experiments to a required level of detail, mainly because they could not be observed directly. And Knupfer particularly struggled with the balance between making an open design and designing anything at all. In the end, he has not given his design a name for example because he feels that it would be too directive and 'reduce the openness the design has now'.

Finally, triggering a mode of improvisation and experimentation was in the design projects mainly achieved by introducing concepts from practice theory. Because practice theory offers an ontology basically different from dominant ontologies in design practice, it is capable of disrupting common ways of conduct. However, finding a balance between disruption and guidance still needs further experimenting. Confronting students with practice theory often left them lost, or returning to known avenues of user research and material focused 'solutions'. When succeeding in triggering a practice-orientation in design students, a next challenge was to trigger it in their clients. In a post-interview with Sealskin (the bathroom company involved in one of the splash projects) for example, the company mentor relates that he felt the splash concept proposed by Karakat deviated too much from the shower practice and to him represents a loss of comfort that only very (environmentally) motivated people might accept. For reducing water consumption in bathing, he sees more in finding ways to market products like a shower timer (that automatically turns off the shower after a pre-set time) or a system to recycle shower water for flushing the toilet. This important stakeholder in the project was not open to

the possibility of extensive change highlighted by practice theory and reverted to the 'standard' responses to reducing consumption levels based on ideas of fixed needs, individual motivations and choice, which in Chapter 2 have been criticized not to render desirable effects.

The limitations revealed by reflecting on the proposed approach in the light of its own recommendations represent opportunities for further theory development at the touching points of sustainable design and practice theory. These will be elaborated on in the next and final section of this thesis.

## 9.4 Future research

Practice theory and sustainable design have only fairly recently met and the two are still getting to know each other. Experiences in this research indicate that their (somewhat fractious) marriage could open up a wide range of new avenues of research, both within and outside of the area of design research. It is impossible to oversee how the relationship may develop, but from the perspective of this thesis, at least two directions for further research can be pictured. The first is based on the reflections made in Section 9.3 and entails a fresh look at sustainable design as a set of practices, and at practice-oriented design as a desirable proto-practice. The second direction builds on the observation, briefly mentioned in Section 9.2.3, that the areas of design and governance seem to have a shared concern for high and rising levels of resource consumption, and that practice theory could function as a common ground to base cooperation on.

### 9.4.1 Making practice-oriented design work

The proposed practice-oriented design approach was illustrated to have worked within the settings of this PhD research, meaning for the researcher and a number of design students, and within the particular empirical topics of bathing, staying warm at home and to some extent, food practices. However, whether and how it would work outside of these settings is not clear at this point. Working towards a practice-oriented design approach that works would involve taking up its own recommendations. In particular, this would involve:

- approaching and analysing sustainable design as a practice or set of practices, implying to:
  - to trace its historic career in terms of changes in configurations of images, skills and stuff
  - explore a variety of similar practices beside practice-oriented design
  - mapping current practices by studying a variety of performances in detail, revealing underlying rationales and studying its material settings
- on the basis of this analysis, identify particularly stable aspects of the practice, reveal undesirable developments and tensions while being aware of the internal logic of the practice

- consider the proposed approach as a proto-practice and develop it through performances, thereby paying specific attention to dimensions of variety and make the proposed approach more open on these dimensions

The analysis would necessarily involve the collection of empirical data, but a starting point could lie in the work of Kimbell (2009), who has studied design activity drawing on theories of practice.

## 9.4.2 Connecting design and governance through practice theory

Governance as a research practice involves the area of (environmental) policymaking and concerns itself with the ways in which societies organize themselves to achieve certain goals, such as sustainable consumption. Besides government, studies of governance include business, media, social movements, non-profit organisations and partnerships between them (Spaargaren 2011). Also directed at achieving desirable future situations, governance can be argued to be all about design. However, the scale at which this discipline works is quite different from the scale of product design. Practices of governance such as (urban) planning, future studies and backcasting create an image of a (possible, probable or desirable) future in the form of scenarios on the scale of a city, sector or nation, while design is focused on single products and their users, or in the case of the proposed practice-oriented approach, single household practices. This difference in scale is exactly where the two could benefit from each other. As Wangel (2012) writes, future scenarios are often 'too marco scaled, quantitative and abstract to communicate with people who are not policy makers and planners'. Introducing skills of practice-oriented design could make these scenarios more concrete and accessible for a wider audience, while at the same time, the scenarios could place proto-practices in a bigger picture of its position in a more desirable society as a whole (Ilsted and Wangel 2013).

## 9.4.3. Invitation to engage

This thesis has explored the implications of social practice theory for sustainable design. Although advancing understanding of the touching points of practice theory and sustainable design and of the value of their integration, the potential created by the particular outlook on design, artefacts and change offered by practice theory has far from been explored fully. Forming a basis to depart from, this thesis therefore invites other design researchers to engage with practice theory and to explore this potential further.